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COMMODORE Disk User

FOR C64 AND C128 USERS

Show report from the Frankfurt Musikmesse

Using an assembler

Tolkien about adventures

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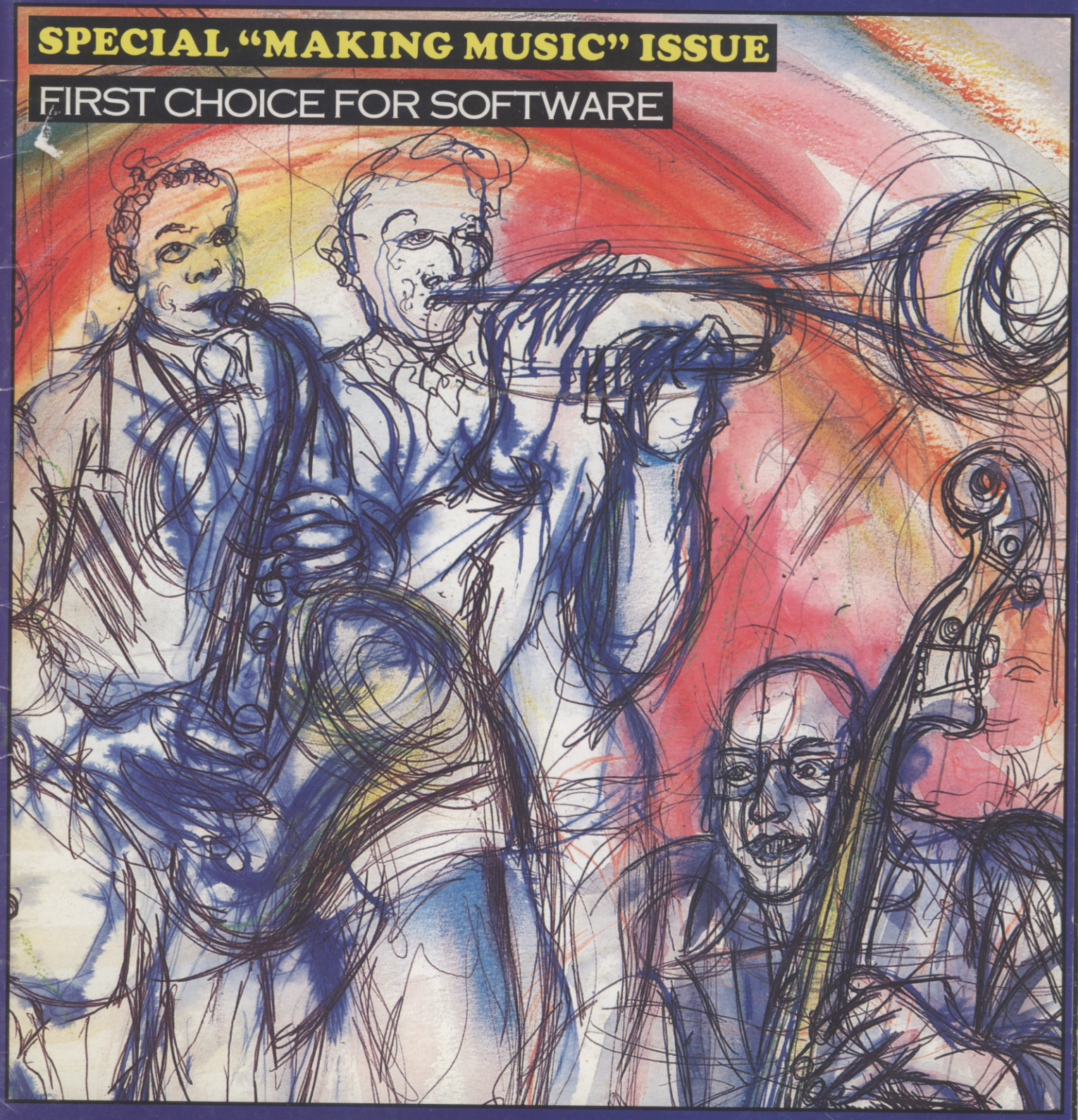

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Well here we go with another action packed issue of *Commodore Disk User*. Sadly we are back to a single sided disk but watch out for more bumper issues in the future.

This issue of *Commodore Disk User* is designed especially for those readers who are prone to blasting their families, neighbours and even the rest of the street out of their beds in the early hours of the morning – you'll find the magazine and disk packed full with programs and articles to help you put your Commodore's sound chip to good use. Programs include **Sid Sequencer** which will allow you to create music with ease, while **Sound FX** allows you to create all of those wonderful bangs and whistles for inclusion inyour own programs.

For the adventurous amongs our readers we have included an intriguing adventure game called Liberté.

Unfortunately a small amount of copy was missed from our **CDU PAINT** program presented in last months issue. The text related to using a printer with the program. As the program stands it supports *Epson* compatible printers only and **NOT** *Commodore* compatible printers. The author of the program, Tony Crowther, is working on a Commodore printer driver and we will present this as soon as we have received it. Appologies for any inconvenience caused.

How to copy CDU files

You are welcome to make as many of your own copies of Commodore Disk User programs as you want, as long as you do not pass them on to other people, or worse, even sell them for a profit.

For people who want to make legitimate copies, we have provided a simple machine-code file copier. To use it, simply select the item FILE COPIER from the main menu. The copier works with a single drive, is controlled by means of the function keys as follows:

F1: Copy file – the program will prompt you for a filename
F3: Resave the memory buffer – you may get an error on a save (perhaps you left the drive door open). Use this to try again.
F5: Disk commands – allows you to enter any regular C64 disk command
F7: Displays the directory
F2: Exits the program and returns you to Basic.

Disk instructions

We have done our best to make sure that Commodore Disk User will be compatible with all versions of the C64 and C128 computers

Getting the programs up and running should not present you with any difficulties, simply put your disk in the drive and enter the command:

LOAD "MENU",8,1

Once the disk menu has loaded you will be able to start any of the programs simply by pressing the letter that is to the left of the program you want.

C128 users please note that you should be in C64 mode when using the disk. You can enter C64 mode by either:

i) Holding down the Commodore key (bottom left of the keyboard) when turning the computer on or,

ii) After turning the computer on type GO64 and answer "Y" when prompted "ARE YOU SURE?".

IT is possible for some programs to alter the computer's memory so that you will not be able to LOAD programs from the menu correctly until you reset the machine. We therefore suggest that you turn your computer off and then on before loading each program.

Disk Failure

If for any reason the disk with your copy of Disk User will not work on your system then please carefully re-read the operating instructions in the magazine.

If you still experience problems then:

1) If you are a subscriber, return it to:
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5 River Park Estate
Berkhampstead
Herts. HP4 1HL

2) If you bought it from a newsagents, return it to:
CDU Replacements
Direct Disk Supplies
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Teddington Business Park
Station Road
Teddington
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Telephone: 01 977-8777

Within eight weeks of publication date disks are replaced free.

After eight weeks a replacement disk can be supplied from DDS for a service charge of £1.00. Return the faulty disk with a cheque or Postal Order made out to DDS for £1.00 and clearly state the issue of CDU that you require. No documentation will be provided.

Please use appropriate packaging, cardboard stiffener at least, when returning a disk. Do not send back your magazine – only the disk please.

Back Issues

Back Issues of Commodore Disk User are available at £3.00 per issue, via:

Infonet Ltd.
5 River Park Estate
Berkhampsted
Herts HP4 1HL

Those magazines available are:

July/August 1988: Utilities – Disk Toolkit, Relocator, Orrery, Message Construction Kit. Games – Mind Games, 3D Breakout, Peggy 128

September/October 1988: Utilities – Fractal Frolics, Location Finder, Score Keeper, Co... Match, C128 Spreadshe... Games – Scorpion, Escape, St... urst, Addit

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November/December 1988: Utilities – CDU FORTH, Texted, Extractor, Windows 64, ZMON 128. Games – Oblivion, Cribbage Master.

January/February 1989: Utilities – Easy Scroller, Data Maker, Border Sprite, Disk Turbo, Menu Maker 128. Games – Blastball, Microdot, Runaway, Colour Bind, Logic, Spots, Life.

March/April 1989: Utilities – CDU Paint, Devaid, 128 Graphics Primer. Games – Darts, Bazair, Araknifoe, Dominoes, Phantom.

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Base-Ed

Base-Ed is the complementary database program to Texted, published in an earlier issue of *CDU*.

By Neil McKearney

Base-Ed is a random access database allowing a maximum of 500 records per disk which may be entered and then subsequently viewed, rectified, deleted and interrogated. Each record can have a maximum of 39 fields but the record length must not exceed 255 characters.

Setting Up a File

Select the *'Set up file'* option from the main menu. You will be asked for the name of your file. Enter anything you like as long as it includes no punctuation and does not exceed 16 characters. After this, the program asks for the number of fields. Enter the amount, which must be less than 30, and you will be prompted to enter the field names and their lengths. Note that all the lengths added must make no more than 255 or the fields will have to be entered again. The program then asks if all the data is correct. If it is type 'Y' to proceed, otherwise type 'N' to re-enter the data.

A message will be displayed on the screen to place a disk in the drive. Make sure there is no valuable data or code on the disk because it will be formatted. Press return and the program will now prepare the disk for use in your file. A flashing box in the top left corner will indicate when the program is working on your disk. When the proccess has finished and the message to press a key comes on the screen, press any key to return to the main menu.

Recording Manipulation

This is the main part of the program where all your work will be done. The options allow you to enter, amend, delete, read and print records or to interrogate the file and search the disk.

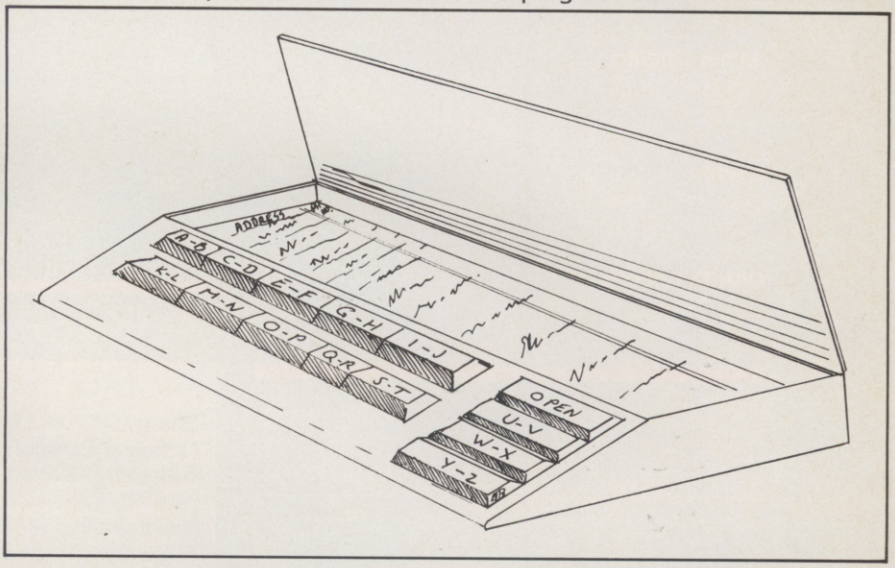
Enter Record

Enter the number of the record in the file and when you press return the program will display the record number and the track and sector to which the data will be written. Now you can enter the record.

Type in the data for each field, pressing return after each. When you have finished entering the record the program will ask if it is all correct. Make your decision and press 'Y' or 'N'. The program will then return to the *'Which record'* prompt. To leave the record entry section press RETURN on this question.

Amend Record

This is the first part of the program in which you can use the INDEX which allows you to call a record by the first field in the record. If, for example, you choose to use a file in which the first field was *Name* you could type in the word 'Name' to view it. If you are not using the index press return, when asked for the field press return again and you will be asked for the record number.



The amendment process involves calling up a record, viewing it and then deciding whether or not to alter it. Call up the record using INDEX or NUMBER. Note that the number method can still be used even if you are using an index. Then, when asked if you want to change it, type 'Y' or 'N' accordingly. If you typed 'Y', the program will ask you to enter the record and, if you have entered all the data correctly, the record will be written to the file and the amendment made to the index. If you typed 'N' the program will return to the record manipulation menu.

Delete Record

Delete allows one record or a group of records from the file to be erased. On selecting this option you are greeted with a sub-menu.

Select the option you require using the keys 1, 2, 3. If 3 was pressed then you will return to the manipulation menu. On pressing 1, you must enter a record number, or first field name if you are using an index. To enter a number, type the number and hit return, otherwise hit return to enter a field. If you have made a mistake and do not want to enter a field here then type return to go back to the sub-menu. If you entered a field or number then, the program will delete the record corresponding to it. The program then returns to the sub-menu.

If option 2 is selected from the sub-menu, two numbers must be entered. These numbers are the record to start deleting from and the record to end deleting. Each record will be deleted and the program will return to the sub-menu. To abort this option, type zero for one of the required numbers.

Read Record

Using another sub-menu, this option allows you to read one record or a group of records. It functions in exactly the same manner as the *'Delete record'* option. Refer to the previous heading for details.

Interrogate File

Enter the first field which you wish to investigate and press return. If the field exists, you will be prompted to enter the search data for that field and,

after this is entered, you will be asked to enter another field. This process continues until you are finished entering fields. When you have finished entering search data, hit return at the *'Which field prompt'* and the program will ask for the record to start and the record to end interrogation. Enter two numbers in the range 1 to 500, or enter nonsense numbers to leave this option. When the two numbers have been entered the program will ask if output is to be directed to the printer. Type 'Y' or 'N' and hit return. Now the program begins to interrogate the file. Each time a record is found that fulfils the search criteria, it is displayed on the screen and the program will wait for you to press a key before it continues.

When interrogation has finished the program displays an appropriate message and prints how many records suited the criteria. Hit any key to return to the *'Record manipulation'* menu.

Disk Search

This part of the program will search the disk records for any string which you enter. The first two questions again ask for the record to start and end searching, enter nonsense data to leave this option. The next question asks you to enter the piece of data you wish to be found and then the disk will then be searched. When, and if, the string is found the program will display the record at which it was found and the track and sector of that record. Type any key to return to the *'Record manipulation'* menu. If the string was not found then hit any key when the search has finished.

View Last Record

Using this option simply allows you to view the contents of the last record entered, its length and the track and sector it was written to.

Print Record

Through another sub-menu, this option allows you to print one record or a group of records. It follows exactly the same format as the *'Delete record'* option.

Exit

Typing 9 at the *'Record manipulation'* menu will return to the main menu.

The Other Features

Base-Ed is designed to work with a multiple drive system and will therefore direct all disk interaction to the device from which it was loaded. It recognises device numbers from 8 to 11.

Base-Ed also has an automatic keybeep option which is turned on at initialisation. From then on, F1 will switch the beep off and F3 will switch it back on.

Disk Maintenance

The disk maintenance section is for sending disk operating commands for the purpose of updating the disk and viewing its contents. If an error occurs which is connected with the disk drive, go to option number 6 in the *'Disk maintenance'* menu and check to see the error. If necessary, refer to the disk drive user manual for an explanation of the fault.

Batch Processing

Batch processing allows you to set up a temporary file, manipulate it and, when finished, write it to the disk in one batch.

The first thing you must do in batch processing is to set the record specifications. This is how many records you will use and what their record numbers are. Select option 8 from the *'Batch processing'* menu. You are asked for start and end parameters.

1. Enter record to start processing.
2. Enter record to end processing.

Type two numbers within the range 1-500. Now you can manipulate your file by using the record entry, record amending, record reading and sort file options. The first three work in the same manner as the equivalent record manipulation options. *'Sort file'* sorts your temporary file into alphabetical order using the first field and the *'Save/Load sequential file'* option allows you to store or retrieve your temporary file for latter use or updating.

The *'Write to Random File'* option takes your temporary file and writes it on to your data disk at the appropriate places and updates your file index accordingly. *'Load from Random File'* loads all the records which have been specified in the *'Batch Specifications'* option and puts them into a temporary file for manipulation.

View Sequential file

When asked whether you wish to view any unprotected sequential file on the screen or printer, type 'S' or 'P' accordingly. Then type the filename and, as long as it is legitimate, the file will be displayed. If you want to leave viewing the file at any stage hit the left arrow key. Press any key when the program finishes displaying the file.

Printer Configuration

To control the device number and print type of the current printer, use the keys 1, 2, 3 to change the device number, double width printing and reversed printing. Hit the 'up arrow' key to leave this option. Hitting the 'M' key will bring you to the Mail label menu.

Mail Labels

Using the mail labels option you can create, store and use a format by which your labels will be printed. In the first heading you must enter the number of lines per label and the number of lines between labels. For every printed line you must then enter the number of fields on that line and then the numbers of the fields on that line. (The number of the field is simply where the field comes in the field order. So if you were using Name, Age and Address as your fields Name would be 1, Age would be 2 and Address would be 3.)

Once this process is finished you have created your mail label format. You can create as many formats as you like because there are SAVE and LOAD options for storing or retrieving a format.

When you want to print labels, select the *'Print Labels'* option and follow the prompts. Then enter the two numbers to start and end printing and the program will print labels in the current format. If at at any stage you wish to pause printing type 'P', type 'C' to continue and 'E' to stop.

If you select option 9 from the main menu you will firstly be asked *'Are you sure?'*. Enter 'Y' or 'N'. Then you will be asked *'Do you want to save the index?'* Again, enter 'Y' or 'N'. If 'Y' was selected then the index will be saved onto the disk. In both cases the system will be reset, leaving you at the power up screen.

Please note that it may be neccesary to use a seperate disk for the index. This is only the case if your first field involves a lot of characters and the file is relatively full.

Loading Base-Ed

Type LOAD"BASE-ED",8,1 followed by RUN. The program will install itself automatically.

These instructions merely summarise the functions and get you familiar with Base-Ed. Setting up and using your own file is the best way to learn about the system but remember to use unimportant disks for experimenting. We hope that Base-Ed will help you with your filing needs.

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* Working with foreign disk formats
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High Speed Graphics

This issue I plan to tackle some aspects with a slightly different flavour. Until now within this series, I have given a suite of routines for use in graphical adventures or games which use a large backdrop which is viewed through a small window. As a suite the routines are able to co-exist without memory clashes. This month's item is quite separate although it should operate with the raster environment active. This module provides a simple approach to data compression and is aimed at "flip screen" games. Such games use a large number of screens which are drawn in one go rather than by using scrolling. Since the normal screen requires 1000 bytes, such games soon use up a lot of memory. It is therefore necessary to use some form of compression to use memory more efficiently. Data compression can be achieved in a number of ways and in the next issue or two I'll look at a few.

Where the screens are built up from repeated shapes, a simple form of rationalisation can be adopted. If you look at *Microdot* in the January/February issue of *Commodore Disk User* you will see a good example of such a game. Here the screens built up as a large array using a number of fixed designs.

In the system provided in this issue, I have divided the screen up into 40 blocks each comprising of 25 characters arranged in a 5 by 5 square. Each screen is then represented by a sequence of 40 bytes, ech one referring to a specific block. The screen and block data are stored in the following areas:

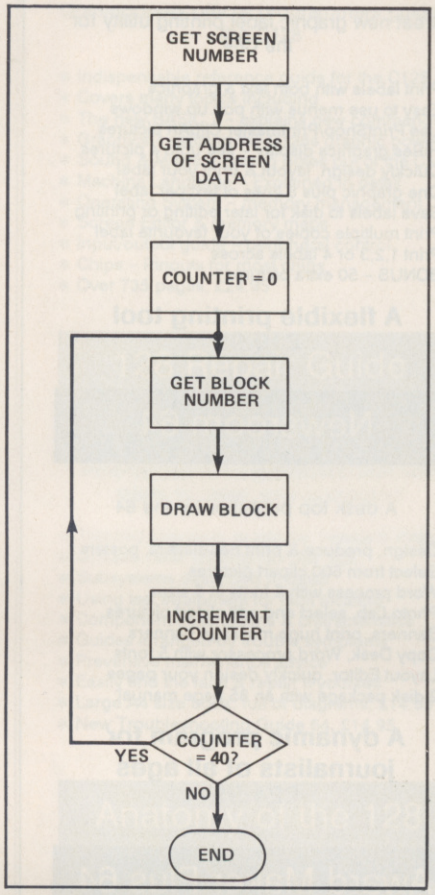
Screens $A000-$B770
Blocks $BB00-$C6A6

Using this amount of memory, 150 screens and 150 blocks can be stored. The screen and block data are stored as simple contiguous tables in the following ways:

Screen 1 occupies $A000 to $A028, screen 2 occupies $A029 to $A051 etc etc. Similarly, block 1 occupies $BB00 to $BB19 and so on.

The system code occupies $C92C to $CA4D and works in a quite simple way. Consider the flow sheet below and you will see how it operates:

If a block value of 0 is used then the screen contents are left undisturbed. This allows you to update only part of the screen, if required. The



final aspect which needs handling is the question of colour. A table occupying $C800 to $C8FF is used to hold colour data. Each byte in the table holds the colour of the corresponding character. The colour for character 0 is held in $C800, character 1 in $C801 and so on.

To assist the use of the system, I have included a simple editor. The hints in the editor show the function of the control keys and I will simply give an outline to it's use. On running the program, three blocks of assembler and some sprite data are loaded. The main menu offers five options:

Edit blocks

This mode allows you to design blocks. If you want to use redefined characters you will need to raise BASIC to $4000 before loading the editor. (Use POKE 44,64: POKE 64*256,0: NEW)

The screen gives the following information:

Top left corner shows the current block number, the current character and it's colour.

In the mid right is the current block.

To amend the block position the square cursor using the cursor controls and press *. This will place the current character in the current cursor position. To set the character colour, use F1 and F3 to choose the colours and then use back arrow to set the colour.

Design Screens

This option has two screens. You enter the option on the design screen. As with the block edit option you move the cursor around using the cursor controls and place the current block using *. Pressing E erases the screen. If you press X, you enter the option screen which allows you to change the screen to be designed and the block in use. Again the useable keys are listed.

Save and Load

These are self explanatory. As I have shown you earlier, the screen, block and colour data occupy the memory from $A000 to $C8FF. These options save and load this memory to disk. I'm sorry that the data block is so large (42 blocks) but its a lot easier to handle than three data blocks.

To use the display code you use a single command:

SYS 51500, SCREEN NUMBER

If you look at the editor listing you will see that the code is used with block 151. The memory arrangement does allow space for 153 screens and I have used screen 151 to provide the design screen. There is no reason why you shouldn't use all 153 screens although the editor won't let you alter the final 3.

The code used to SAVE the data block is the SAVEALL code I gave earlier in the series. The LOAD code (L.OBJ) is also handy. If you want to LOAD code to a space other than the normal BASIC space, you must use a secondary address of 1. Lines 10 to 30 show what I mean. This command unfortunately forces the program to rerun so you must use a trick (such as PEEKing to see if the code has been LOADed) to prevent the program from repeatedly looping. The LOAD code gets around this problem. The code sits in a small area of spare ram and has the syntax:

SYS 679, "filename", 8, startaddress

The code is loaded starting at the specified start address and the program is not rerun. The code uses locations $CF01, $CF02 and $CF03 – $CF1F as work space so beware.

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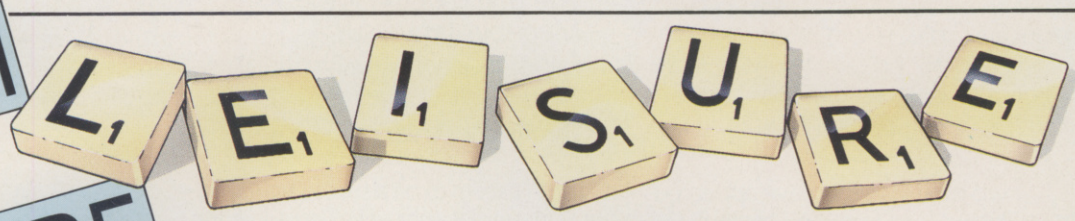

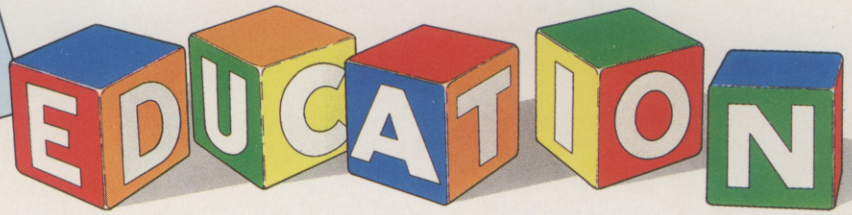

Commodore computer show

Britain's brightest event for Commodore computer users is back! And there's more to see than ever before.

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And you'll also be able to attend seminars covering all aspects of using Commodore micros in your business.

Leisure

The C64 and Amiga computers are the most powerful 8 and 16 bit micros for producing fast-action arcade quality games. The range of new software on show will demonstrate how these machines' power is continually being stretched, producing faster and even more addictive games with superb graphics.

If you're a keen game player, you'll find there's so much on offer at the show you're guaranteed a real treat!

Education

Commodore micros are now used as educational tools all over the country. With the development of BBC Basic on the Amiga, and the advent of Desktop Video (combining TV pictures with text and graphics), the range of educational applications is endless.

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Special Events

As well as special events and presentations, you'll also be able to meet some of your favourite celebrities, and maybe get a chance to talk with them about how they use micros in their work.

So for a great day out, whether you want to see what the future holds for Commodore computers, to buy the latest software or to get advice on specific applications, the Commodore show is the place to go. And if you send in the coupon today, we'll knock £1 off the price of each ticket!

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A673

Sticky Decision

The battle of the joysticks – Megablaster versus Supercharger

By Andy Andros

Two new joysticks have appeared lately. One from newcomers, De Gale Marketing, and the other from uncrowned champions, Konix. Each show a differing approach to the hand controller concept but compete for the same market.

The perfect, Platonic joystick would be solidly built, unbreakable and accurate in any of its eight directions. The body and handle would fit snugly in even the smallest hand and the fire buttons would be comfortably positioned and as responsive as a flapping leaf in a gentle breeze.

Reality could never reach such perfection but our search is never-ending.

Megablaster

The Konix stick is a budget priced unit and on looking inside the reasons become obvious. The switches are crude contact switches – probably the crudest switches in the world. Before you jump to the conclusion that this is deterioriating into a slagging-off session, read on and you may be surprised.

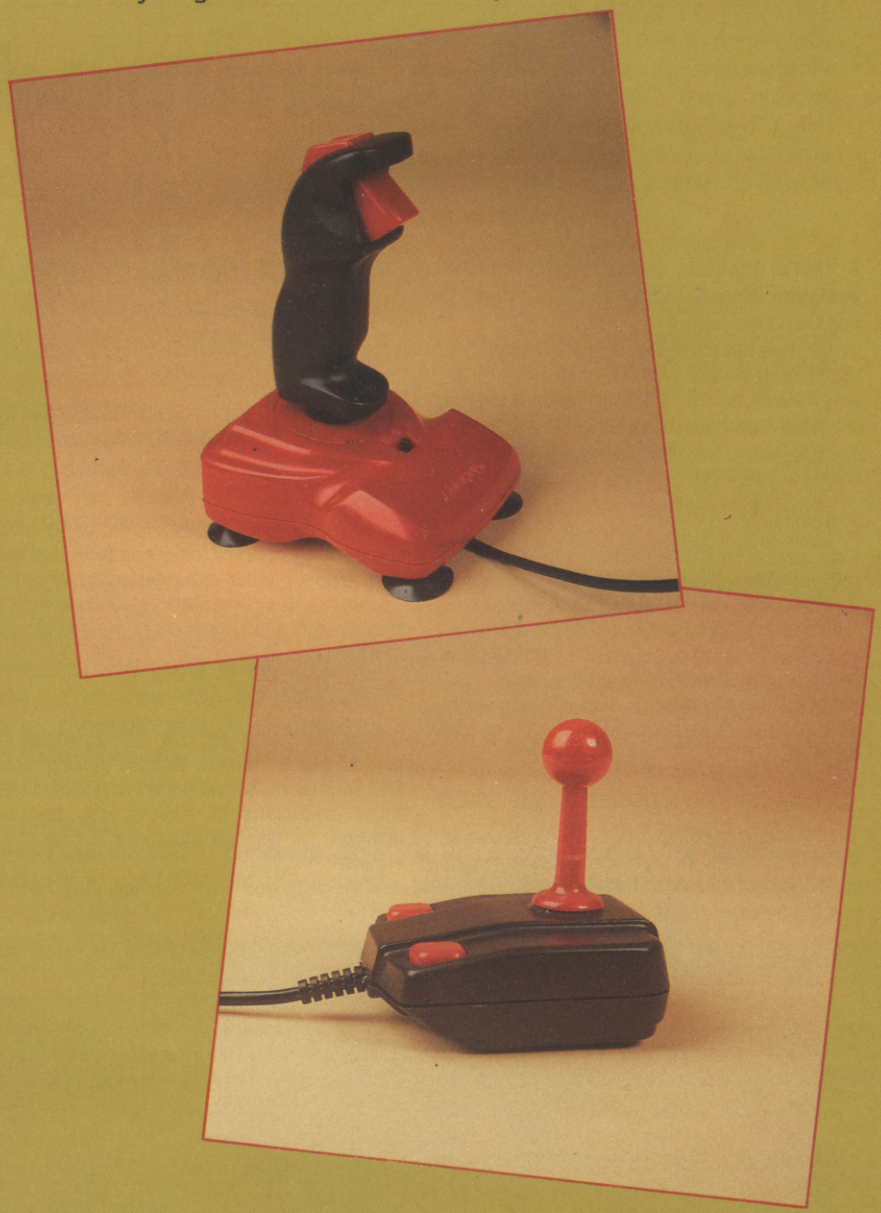
Each fire button consists of a plastic mount holding a washer suspended over two wire terminals by a spring. When the button is pushed, the spring compresses and the washer connects the two wires together. This may be extremely crude but these two switches should outlast any microswitches.

I'm not so thrilled with the simplicity of the direction selection handle, however. The internal extension of the red external knob and stem is a long soft spring which sits in a small, square well, the walls of which have terminals centrally positioned in a north, south, east, west formation. As the stick is waggled, the spring bends and makes or breaks contact with the terminals either singly or in pairs. In use, the stick proved to be quite successful for vertical and horizontal moves but diagonals were a little harder to hit accurately. For mad, devil-may-care shoot-em-ups this didn't seem to be a severe handicap but with games that relied on accurate angle selection, the uncertainty became a little irritating.

Supercharger

If it's a solidly built joystick that you are looking for, this is as tough as they come. The body is Ferrari red and looks more like a discarded design for a toy car than anything else. The handle is ergonomically shaped to fit comfortably in the hand and the red firebuttons are placed on the top and, as a trigger, on the front. This gives the player the option of using the thumb or the forefinger to fire with – when one gets tired, you can always use the other.

The switches are all sealed-unit microswitches which are extremely reliable and make diagonal movements easily selectable. Each time a switch is depressed it makes a confirmatory click



and the positive feel of the handle adds to the sense of all-round ruggedness.

Perhaps for smaller hands, the base could be tiring to grasp for long periods because it is quite broad and would have to be 'nipped' between the palm and thumb. This problem is offset partially by the presence of suckers on the base which can grip any suitably smooth surface.

In front of the handle, the base sports a small three-position switch which has no effect when centrally positioned and selects autofire if pushed to the left. The placement to the right is reserved for Amstrad CPC autofire compatibility. Unfortunately, this switch is in such a position and so easily moved that it is all too easy to flick it from its set position without immediately realising it.

Choice Picks?

Neither joystick satisfies me totally. The Supercharger stick is solid and reliable and the Megablaster is simple and cheap. The weak point of any joystick is usually at the base of the handle. When testing the Supercharger stick, it resisted quite a large loading of extra pressure without any obvious strain but the much flimsier Megablaster handle started to show stress marks when subjected to similar pressure (see photograph).

The stress imposed was far higher than would be exerted under normal use. The purpose of the test was to see how the sticks would stand up to careless handling because it must be borne in mind that any stick that is left lying around will eventually get trodden on.

Perhaps it is unfair to compare the Supercharger stick with the much cheaper Megablaster but the latter stick showed up very well in tests. This says a lot for the manufacture of the Megablaster but says little about the more expensive stick which should be seen against the similarly-priced opposition.

The Supercharger controller is far more hard wearing than any stick that I have seen. This results in a rather bulky, chunky design which may lack visual appeal but weighing this against its potential longevity, the stick is a real bargain.

For my money, the lower price and more stylish appearance of the Megablaster makes it a throwaway bargain which places it above the Supercharger stick. Actually, neither of them would win a beauty competition but given the choice, it has to be Megablaster.

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Dbase 128

A special treat for C128 owners in the shape of a handy database

By Richard Clements

Once the program is loaded and running, you will be presented with a main menu. You will notice that option 1 reads SET-UP A DBASE. So, the first thing we do, is to press 1 and you will be asked for the name of the Dbase to be created. The first 12 characters of the name will be used as the filename. We will call our example Dbase EXERCISE 1

You are now required to enter a field list. When you have entered all the fields you wish to use, press RETURN at the prompt. Here's a list of the fields we are going to use:-

NAME RETURN

SURNAME RETURN

TELEPHONE RETURN
RETURN

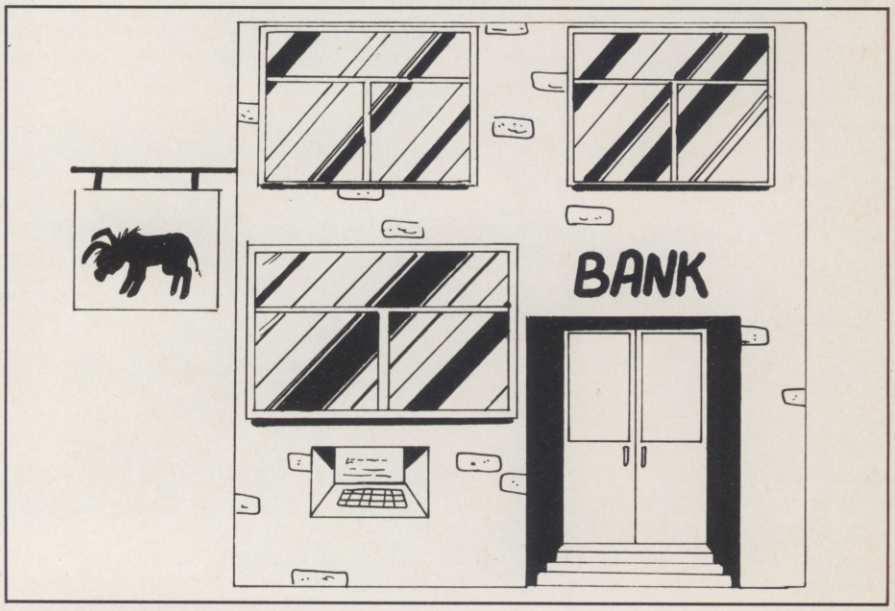
The next prompt is CREATE DBASE?, type 'Y' and the Dbase files will now be placed on disk.

Once back at the main menu, we will add some records to our newly created file.

First the file must be loaded so the software knows which fields we need to use. This is done by pressing 2 at the main menu. You will then be prompted for a file name. Since we called our Dbase EXERCISE 1, enter that name and the Dbase will be loaded. If you have only just created the file you will get a message on screen telling you that you have no records in your database. This is nothing to worry about.

Press 3, so that a record can be added. You will be asked to enter the relevant information beside the field name. All the inputs you type must be less than 26 characters (end the line) and must not have colons or commas in them. Once you have entered all the relevant information, you will be asked if the information is correct. This is your only chance to abort before adding the record. press 'Y' at this prompt to save the data to disk.

Follow the above description to enter the following data.



NAME:	FRED
SURNAME:	BLOGGS
TELEPHONE:	(01) 000 1234
	JOHN
	SMITH
	(2365) 967262
	ANGELA
	JONES
	(01) 762 0101

You now should have 3 records on disk. Check this by using option 5 to display all your Dbases' statistics.

Mrs Joans has just changed her phone number. We now need to edit her file. Select option 6 and press 'N' (for next record) until you get to Angela's. Once you can see her file, press 'E' to edit. You will notice that you can edit each field of her file. Press return for the first and second fields, then type in the new phone number. (Which is - (01) 762 8251). You will be presented with a small sub menu. Selecting Re-Start will let you continue through the record list, without changing her record. Press 'S' to save the new details to disk.

To see the whole contents of our file, select option 2. Go through the fields entering wild cards by pressing RETURN at each field entry. This acts as a wild card for the whole field, 'Q' to exit to the menu, or 'N' to continue to the next record.

We now wish to find all records of people who have a London phone number (01). So, select option 2 from menu, then enter the following information:-

NAME:	RETURN
SURNAME:	RETURN
TELEPHONE:	*01* RETURN

When returned to the Menu, you can now delete John Smith's record. Select option 4, press 'N' for next, until you arrive at John Smith's record. Next press 'D' and the record will then be deleted.

We have finished our alterations to our Dbase, now we can make a back-up. Press 1 on this menu to return to the main menu. If you find that there are too many windows on the screen, and wish to clear the screen press the back arrow key to clear the screen and re-display the current menu.

A back-up utility lies in the UTILITIES MENU, which is option 3 from the main menu. You will now see the sub-menu, notice that option 2 is used

to back-up a Dbase.

Select option 2 and enter the name of the Dbase, in this case EXERCISE 1, and press RETURN. After confirming the back-up, the software will proceed in copying your Dbase. To see the directory select option 4 (Directory view), and you will notice a file EXERCISE 1 . BDC. This is the Dbase back-up file. Press RETURN to return to the menu, and then select option 6 for main menu. That is the end of this session. Pressing option 5 from the main menu will tell you how to get on-screen help.

Specifications

PRINTING

The software will send printing information to devices 4, 5 & 6. Device 6 configuration can be changed because it is meant for the CBM 1520 plotter, and changing the configuration from the main menu, will let the plotter print in any of the colour available or at any of the 4 sizes available.

WINDOWS/MENUS

The software is window/menu driven. This allows the system to be user friendly, while looking reasonably attractive.

ON SCREEN HELP

By pressing 'H' at any of the 3 main menus (Main, Utilities and Dbase alterations menus), help will be displayed on items available in that particular menu.

CLEARING UNTIDY SCREENS

Also at any of the 3 menus, pressing " -' (Back arrow) will clear the screen of all menus, and re-display the current option.

FILE CONFIGURATION AND 40/80 OPTION

The software is configured from the loader. Configuration is mainly for the plotter, and is done automatically, unless a file "CONFIG .CFG" is present on disk, when the configuration will be loaded from this file. The only other configuration to take place at the loader stage is if the user wishes to use 40 or 80 columns. Using 80 column mode allows the software to use 2Mhz mode (fast mode) which in turn allows fast disk access and screen updates.

DRIVE COMPATIBILITY

The system uses USR files to save file data. To the best of my knowledge (now owning a 1581 myself), the 1581 allows USR files and should work with Dbase 128. As for other CBM drives (1541, 70,71) and compatibles, these should work without any problems.

DISK FILES

The system uses three files to keep track of the Dbase. A free entry should always be left in the directory for temporary file writing.

The three files and contents are:

name.DBC – Dbase field list and Config.

name.DBN – Number of records Dbase has.

name.DBF – Dbase records data.

A file may end with ".BD?", the question mark being either C, N or F. The BD stands for back-up Database, and is simply a back-up file that the user has made.

OVERALL SPECIFICATION

* 40/80 Coloum compatible.
* 1581/71/70/41 compatible
* On screen help
* Special plotter and drive configuration.
* User friendly windows and menus.

Extra Information

Files Listed on this Disk, and those which are needed to run Dbase 128.

BBASE LOADER. RUN –	This is the loader, which loads and configures DBase 128. Dbase 128 should *always* be loaded via this program.
HOS FONT V3 .FNT –	This is the font which is used when 40 Column mode is selected.
DBASE 128 V1.OPT –	This is the main Dbase program file. The file has been compacted using a Basic file compactor, to save disk space. This file is loaded from DBASE LOADER.RUN
DBASE 128 V1.BAK –	This is the Basic file before compacting and should only be used for De-bugging.
CONFIG .CFG –	This is the configuration file which tells Dbase what drive to load files from and, if plotter configuration is set, what size and colour the plotter should print in. If this file is present on the disk when Dbase is booted, the configuration in the file (created by the user) will be loaded.
FILES NEEDED:	DBASE LOADER. RUN HOS FONT V3 .FNT DBASE 128 VT.OPT
TOTAL DISK SPACE NEEDED:	92 Blocks.
FILES PER DISK	up to 47 (with Dbase 128)
MAXIMUM BYTES PER FILE	up to 168656 (average – 714 records with 10 fields full)
MAXIMUM FIELDS ALLOWED	20
CHARACTERS PER FIELD	26 (Max)
INPUT LIMITATIONS	Commas and Colons (", ":") can not be used anywhere in the database.

6510+ Assembler

Use this once and you may never need another aid to writing machine code programs

By Dave Weaver/Compunet

This assembler is a valuable aid both for writing professional machine code programs and for learning about programming. It is a three-pass assembler which allows the use of labels and contains extra commands that speed the production of code by permitting merging routines from tape or disk, finding and changing given strings, deleting of redundant lines, auto line numbering and, as you will see, a host of other commands. Once the code is assembled, an in-built memory monitor can be used to save or modify the raw code.

Before looking at this powerful programming tool, we'd like to say thank you to *Compunet* for making this program available and a special thank you to Dave Weaver for writing such a beautifully logical assembler.

The 6510+ is a powerful three-pass, disk-based assembler/editor for the Commodore 64.
It features:

- Standard 6502 mnemonics and addressing modes.
- An advanced Pet-like, machine code monitor built in.
- Enhanced screen editor, including FIND, CHANGE, MERGE and many more commands.
- User definable function keys.
- Assembly from disk.
- Source-code compatability with Supersoft's popular MIKRO assembler.

Labels
A label is an alphanumeric string of uppercase characters, the first of which must be a a letter (A-Z). It can be any length (well, up to 250 characters, theoretically, but it is physically impossible to enter a label of much more than 70 characters on a line of source code).

Comments
A comment can appear either on a line of its own, or on the end of another line. The comment must start with either a semi colon (;) or an exclamation mark (!).

Any text entered after a comment is not tokenised by the Basic interpreter. This has the unfortunate side effect that any PRINT commands used whilst using 6510+ will report errors if they contain a semi colon. This shouldn't cause too much of a problem. After all, who uses Basic?

Assembler Directives
In addition to the standard 56 mnemonics, the assembler accepts certain other three-character commands during assembly, namely BYT, TXT, WOR, END, OUT, OFF, CHN, LNK and LIB. These operate as follows:

BYT is used to reserve one byte of memory and load it with a value. BYT directives may contain a series of comma-separated byte values, which will be stored in consecutive memory locations. ASCII strings may be generated by enclosing the string in double quotes.

```
BYT 2, 3, FRED
BYT 'HELLO WORLD!'
BYT 5+4, 'YES', 0
```

All values must be single byte values, they must therefore be between 0 and 255.

TXT is included for MIKRO compatability. It is equivalent to the BYT instruction.

WOR is used to reserve and initialise two bytes of data at a time. Each value in a WOR command is considered to be a two-byte value (0-65535) and is stored in standard low-byte-first format.

```
WOR $1234
WOR %1100101011001
```

The first example would be stored as two bytes: $34 and $12.

END indicates the last line of source code. Any lines after an END directive will be ignored by the assembler during assembly. This is optional if it is the last line of the source code.

OUT causes a listing to be generated on the third pass of an assembly from the line of the OUT command onwards. The listing is produced on the screen but if you would like a listing on a printer, enter OPEN4, 4:CMD4 before assembling the program. This redirects the screen output to the printer. Please note that this is not exactly the same as MIKRO's OUT command.

OFF turns off a listing (started with OUT) for the rest of the assembly, or until another OUT command is found.

CHN and *LNK* are equivalent commands that allow several source files to be 'chained' or 'linked' together. This command terminates assembly of the current file, and loads in the specified file. There are no restrictions on the number of files that may be chained in this way. The last file in the chain must use an END command followed immediately by the name of the first file in the chain. In this way the next pass can begin with the correct file!

```
file 'PART1': 10 INC FRED
              20 RTS
              30 CHN 'PART2'
file 'PART2': 10 FRED=53280
              60 END 'PART1'
```

LIB allows you to insert source code from another file into the assembly. When the assembler encounters the LIB directive, it temporarily stops reading source code from memory, and reads a line at a time from the file named. Processing of the in-memory source resumes after either an end of file or an END command is encountered in the LIB file.

```
file 'ONE' 10 *=49152
           20 FRED=53280
           40 END
           30 LIB 'TWO'
file 'TWO' 25 INC FRED
           99 RTS
           100 END
```

This command allows you to make your code much more modular. In fact the 'main' program could consist of only a series of LIB calls.

```
1000 *=49152
1010 ;
1020 LIB 'START'
1030 LIB 'MIDDLE BIT'
1040 LIB 'SOMETHING ELSE'
1050 LIB 'THE END'
1060 ;
1070 END
```

Expressions

An expression can be used at almost any point that a single number could be used. It consists of one or more numbers/labels, each separated by one of a group of mathematical operators as shown in Table 1.

Table 1:

Op	Purpose	Example	Result
+	Addition	10+4	14
–	Subtraction	$1a-11	15
*	Multiplication	%1010*13	130
/	Division	54/10	5
%	Mod (remainder)	54%10	4
&	Bitwise AND	6&3	2
	Bitwise OR	63	7
	Bit shift right	1 4	%10000
	Bit shift left	%10110 2	%101

The following unary operators are alos provided:

Op	Purpose	Example	Result
,	take ASCII value	'A	65
<	take low byte	<$1234	$34
>	take high byte	>$1234	$12

All operators have equal precedence.

A $ is used to indicate a hex number, and % is used to indicate a binary number. A number with neither a $ or a % is assumed to be decimal.

All expressions are evaluated in left to right order. Brackets may be used in an expression to force the order of evaluation to be other than left to right.

```
1+2*3=9
1+(2*3)=7
```

The fact that three of the operators (%, < and >) are used for two different things may appear confusing at first, but it is quite apparent which action is meant from the context in which the expressions appear.

Two special characters (* and @) may also appear in expressions. These have the values of the *program counter* and the *AT counter* respectively. These will be explained in more detail later.

```
FRED = $1230+4              $1234
LDA < FRED+2                  $36
BLAH = $100*(2+3)            $500
XXX = 50/10                     5
LDY # 3< XXX        %1100000 (96)
```

The program counter

In order to tell 6510+ which area of memory you wish to assemble your code to you need to set the *program counter* (the * variable) to the address required.

For example, to assemble your code so that it is placed to run at address 49152 onwards:

```
10 *=49152
20 ... rest of code
```

During assembly the * variable will always hold the address for which the current instruction is being assembled. This enables you to program simple branches without the need for labels.

```
240 CMP # 10
250 BNE FRED
260 INY
270 FRED STY SOMEWHERE
```

could be written as:

```
240 CMP # 10
250 BNE *+3
260 INY
270 STY SOMEWHERE
```

Because in the first example, FRED will always be three bytes further on than the BNE instruction.

Now, consider the following problem. You have written a program (such as an amazing assembler to rival 6510+) which needs to be assembled at address $8000 onwards.

If you put a *=$8000 in your code, it would be assembled to this address but this would put it in the same area of memory as 6510+ which would then be overwritten (although 6510+ will recognise this fact and warn you).

The solution is to use , the *AT-counter*. This is similar in concept to the program counter but, whilst the program counter tells 6510+ the address at which the code is to run, the AT-counter tells 6510+ where in memory to place the final assembled version.

One answer to the above problem is to use:

```
10 *=$8000
20 @ =$4000
30 ... rest of code
```

This would cause 6510+ to assemble the program as if it were to run at $8000, but the final assembled code will be placed in memory at $4000 onwards. The program can then be saved to disk using the monitor, the computer then switched off and on (to remove 6510+) and the program loaded in and moved to $8000 where it can finally be run. (A bit long-winded I know, but it works).

There is an alternative way to set up the AT-counter, which is included for MIKRO compatability. This previous example can also be written as:

```
10 *=$8000, $4000
20 .. rest of code
```

Note that setting the program counter will also set the AT-counter to the same value. So, if you're using the AT-counter (you won't normally need to) then remember to set up @ *after* setting up *

Editor Enhancements

A number of additions have been made to the way the normal screen editor works while using 6510+.

The left SHIFT key may be used to pause output to the screen. For instance, when listing the source code, the SHIFT LOCK key may be used as a pause and hold key.

When the RUN/STOP key is pressed the quotes mode and number of outstanding inserts flags are set to zero.

SHIFT + will put the cursor in the bottom left corner of the screen, like a sort of un-home key.

A DOS wedge routine has also been included. Entering @ will give the disk drive status. Typing @ *command* will send 'command' to the disk drive. Typing $ will display the disk directory, without actually loading it into memory. The $ can also be followed by a wild card to give a partial directory. The default device is used (see later).

For example, to format a disk type:
@ N:NEW DISK, OK
to display the disk directory:
$
to display a directory of all sequential files beginning with the letter A:
$0:A*=S
=S gives just SEQ files and A* gives files beginning with A

6510+ also allows the eight function keys to be defined to hold any string of up to 31 characters. More of this later.

Basic Extensions

6510+ adds over 25 new commands to the existing Basic ones.

With 6510+, any Basic commands will now accept hex and binary numbers, as well as decimal numbers, by preceding them with a $ and a % respectively. So the following are all valid, using 6510+:

```
PRINT $123*%1010
PRINT CHR$ ($40)
```

Now onto the new commands. In this section any item in square brackets is optional and may be left out. All commands may be abbreviated as in Basic (A shift-S instead of ASSEMBLE).

Editor commands

OLD

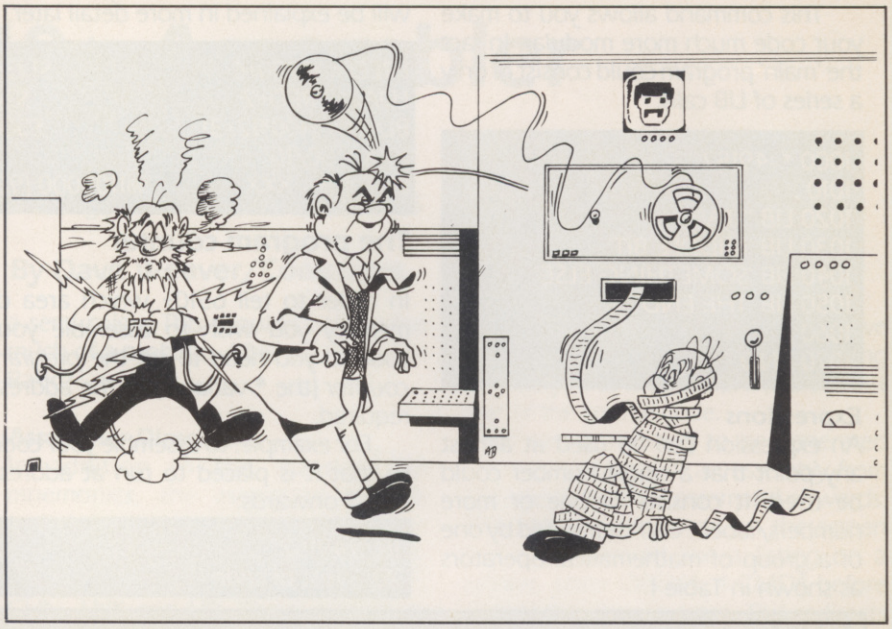
This is the opposite of NEW. A program that has been NEWed can be recovered using OLD.

AUTO (line-number [,step])

AUTO will present line numbers automatically when a program is entered. The number presented will be the number of the previous line plus the current step value. Auto line presentation is turned off by pressing return on a blank line. If no step is given the value of 10 is used. If no start line is given the value 1000 is used.

RENUMBER (start-line [,step])

This will renumber a program starting at the given line number, each time adding the given step to produce the next line number.



DELETE line-range

DELETE will remove sections of the current program. The line-range given is in the same format as the Basic LIST command.

```
DELETE 1230-2000
DELETE 100-
DELETE -1293
```

FIND XstringX

This command will search the source code for the string given. Any lines containing the string will be listed to the screen. **X** is any character not included in the string.

```
FIND 'HELLO'
FIND/LDA/
```

CHANGE XstringX replacementX

This will search the source for the given string and replace it with the replacement string. Each line where a change is made is listed to the screen.

CHANGE @ HELLO@HELLO WORLD!@
Changes all occurrences of HELLO to HELLO WORLD!.

CHANGE"!""
Remove all exclamation marks from the source.

It is important to remember that the exclamation mark (!) and semi colon (;) are used to start a comment in 6510+ source code, so any characters following these will not be tokenised. This can cause some problems with the FIND and CHANGE commands. For example:
CHANGE /!/*/ will NOT change all exclamation marks to asterisks. This is because the / has two different values in the line above. The first is tokenised into the divide token. The next two are not tokenised since they follow an exclamation mark. Instead use CHANGE "!"*" This will work since the exclamation mark is not taken as the start of a comment starter, because it is in quotes, and everything in quotes is taken literally.

Function Keys

KEY

This will display the strings currently attached to the eight function keys. A ← in the string represents a RETURN.

KEY number, string

This form of the same command will let you change the key definition to anything you choose. Only the first 31 characters of the string are used.

KEY 1, "old"← renumber ←
(The ← is used to insert RETURNs in the string)

KEYSAVE "name" [,device]

This will save the current key definitions to disk or tape.

KEYLOAD "name" [,device]

This will load a key definition file from disk and re-program the F-keys accordingly. The default device number is used if none is specified.

KEYOFF and KEYON

These commands will disable and enable (respectively) the new function key routines.

This is useful for those lucky people who have alternative operating system ROMs installed (such as those supplied

with parallel DOS systems) which have their own F-key definitions.

With Trilogic's PHANTOM parallel DOS (which is all I've tried 6510+ with so far), if the key routines are enabled (KEYON) and a key is defined as nothing (KEY1, '') then the default PHANTOM definition is used instead.

HELP

This command will display a list of all new and modified commands.

It is only meant as a brief reminder. For more details read this documentation carefully.

Disk related commands

LOAD "name"
SAVE "name"
VERIFY "name"

These commands have been modified so that the default device is used (usually device 8 – the disk drive). See the DEVICE command later on for more details.

TYPE "name" [,device]

This will read the given file and display its contents on screen. TYPE will only work with SEQ files. The default device is used if none is specified.

DUMP 'name' [,device]

This will display the named file in hex and ASCII. DUMP will work with PRG, SEQ and USR files. The default device is used if none is specified.

MERGE 'name' [,device]

MERGE will read the named file, one at a time, and enter each of the lines as though they had been typed at the keyboard. In other words, the named file will be MERGEd with the current program in memory. If the same line number exists both in the file and in memory, the one from the file will over-write the one in memory.

Once again, the default device will be used if no other is specified.

APPEND 'name' [,device]

This command is very similar to the MERGE command but the named file is APPENDed (added to the end of) the one in memory. Line numbers from the file are not changed so it is advisable to RENUMBER your program after using APPEND.

DEVICE [device number]

This command sets up the default device number which is used by all of the disk-based commands in 6510+. If the device number is not specified then the current device number is shown.

Assembler commands

These are what 6510+ is all about. In this section *expression* means a mathematical expression. It may contain labels, numbers and operators. Some valid expressions:

```
10
FRED
$1A+ (LINE*40)
%1010+>SCREEN
```

ASSEMBLE [line number]

This will assemble the source code currently in memory. If a line number is given the assembly will start at that line, otherwise it will start at the first line of source. Assembly can be stopped at any time by pressing the RUN/STOP key.

DISASSEMBLE < expression >

This will display a disassembly of memory from the address specified in the expression. disassembly is stopped by pressing RUN/STOP and the left SHIFT key or SHIFT LOCK can be used to pause the listing.

DISASSEMBLE may be abbreviated as D shift-I.

```
DISASSEMBLE START
DISASSEMBLE 4096*12
```

NUMBER < expression >

This will evaluate the expression and display the result in hex, decimal and binary. It is useful for displaying the value of a label or for converting between number bases.

TABLE

This will display the symbol table, from the last assembly, in alphabetical order. Each label is followed by its hex value.

SYMSAVE 'name'[,device]

This will save the symbol table to disk. There is not much use for this yet but it is included in case I decide to write some accompanying utilities, such as a symbolic debugger, which would need the symbol table.

FORMAT < line range >

This command is very much like the LIST command except that the listing is neatly formatted. Try it and see.

SET < label > = < expression >

This command allows you to manually add to or modify symbols in the symbol table.

```
SET BANANA=FRED*2
SETX = $2345
SET LO= < ADDRESS
SET HI= > ADDRESS
```

Modified Commands

Some existing Basic commands have been modified for use in 6510+.

```
POKE < expression >, < expression >
PEEK ( < expression > )
SYS < expression >
```

These commands now use the expression evaluator built into 6510+. This means that hex numbers and labels can now be used.

```
SYS START
SYS GO+3
SYS 4096*12
PRINT PEEK (COUNTER)
POKE $D020,0
POKE FRED,<VEC: POKE FRED+1,
>VEC
```

SAVE ("name"[,device])

The SAVE command has been modified to provide a useful auto-naming facility.

When provided with a name and device number, SAVE works as usual and uses the default device number if none is specified. If no name is given, the first program line in memory is examined. If it begins with a comment symbol (exclamation, semi colon or REM) and the next character is a double quote, then the file name is taken from there.

This means that each of your programs can contain its name in the first line, and you don't have to worry about remembering what it was.

```
10 ;"@:PART1",8
1 !"@:TEST"
5 REM "@:HELLO",8
```

Notice that the names include '@:'. This is so that when you type SAVE the program will replace the current version on the disk.

LOAD ("name" [,device])
VERIFY ("name" [,device])

These commands have been modified so that they use the default device number set up by the DEVICE command. If no name is specified '*' is used and the first program on the disk directory will be used.

IMPORTANT NOTE

Because of the way these

commands are modified, you may find that running ordinary Basic programs within 6510+ isn't necessarily a good idea. This is because the POKE command (for instance) no longer uses the Basic expression evaluator and no longer recognises Basic variables.

The following program would not work using 6510+:

```
10 FOR I=0 TO 255
20 POKE 1024+I,I
30 NEXT
```

You would get an ?UNDEFINED LABEL error in line 20. But you could use:

```
10 SET X=0: FOR I=0 TO 255
20 POKE 1024+X,X
30 SET X=X+1
40 NEXT
```

The Monitor

6510+ contains a built-in machine code monitor. To enter the monitor type:

MONITOR

The monitor will then display the current register values, and present you with a full-stop as a prompt.

All monitor commands are a single character, usually followed by some hex parameters.

In this section *< addr >* contains up to four digits representing a memory address in hex.

D < addr > [< addr >]

This will disassemble the memory between the two addresses. If the second address is not given then only one line of disassembly is shown.

F < addr > < addr > < value >

This will fill the memory between the two addresses with value, where value is a number in the range zero to FF.

T < addr > < addr > < addr >

This will transfer the block of memory between the first two addresses to the area beginning at the third address.

H < addr > < addr > < value > (< value > ...)
H < addr > < addr > 'text

Hunts between the addresses specified for the series of values given.

In the second form, a text string may be given if preceded by an apostrophe. The monitor will search for the text supplied.

```
H 1000 2000 A9 00
H 1000 2000 'HELLO
```

M < addr > [< addr >]

Displays the memory range given in both hex and ASCII.

To modify the memory contents, simply move the cursor over the hex number to change, type the new value and press RETURN.

R

Displays the current register contents, in the form shown in Fig. 1. Any of the values may be changed simply by moving the cursor over the current value, typing the new value and pressing RETURN.

current IRQ vector

Y register

Accumulator

PC	IRQ	SR	AC	XR	YR	SP
;1234	EA31	30	10	A1	00	F5

program counter

status register

stack pointer

X register

Fig 1: Register contents

G [< addr >]

This command, GO, will execute the machine code routine starting at the given address. If no address is given, the value in the Program Counter (PC) will be used.

L "name" [,device]
V "name" [,device]
S "name", device, addr1, addr2

These commands will Load, Verify or Save blocks of memory. The L and V commands will use the default device if none is specified.

The S command saves the area of memory between *addr1* and *addr2*-1. Always remember that addr2 must be the address immediately after the last byte to be saved.

When a program is assembled, the start and end addresses of the assembled code are displayed liked this:

```
START ADDRESS: $2000
END ADDRESS: $2134
```

To save the assembled, executable code, enter the monitor (with the MONITOR command) and type:

```
S'PROGRAM', 08,2000,2134
```

X

This command exits the monitor and returns to the assembler.

Error Messages

There follows a list of errors that can be produced by 6510+ during assembly. If an error does occur during assembly, the offending line will be displayed and assembly will stop.

If an error occurs in a LIBed file, the line containing the error will still be listed along with the name of the file in which the error was found.

DUPLICATE LABEL

This error message occurs if the same label is defined more than once in the source code. A label may only have one value.

UNDEFINED LABEL

This occurs if a reference is made to a label which is not defined anywhere in the source code.

TOO BIG

This error is produced if the result (or partial result) of a calculation is a number larger than that which will fit into two bytes (65535). It may mean that you need to re-order your calculation slightly.

```
60000+10000-8000 gives TOO BIG
60000-8000+10000 is OK
```

NEGATIVE

This error is produced when the result or partial result of a calculation is less than zero. Again, you may need to re-order your calculation slightly.

BAD NUMBER

This occurs if you enter a non-hex digit after a $, or a non-binary digit after a %.

```
$R0    = BAD NUMBER
$A4    = ok
%200   = BAD NUMBER
%1000  = ok
```

ADDRESSING MODE

This error is produced when 6510+ encounters a line containing either an addressing mode that does not exist or one that is used inappropriately.

```
LDA (19), X no such mode
STA (FRED) no such mode
```

BRANCH RANGE

Branches may only branch to a location within a range 128 backwards or 127 bytes forwards from itself. Any attempt to branch to a label outside of this range will produce this error.

OUT OF STORAGE SPACE

6510+ uses the memory underneath the I/0 and Kernel ($D000-$FFFF) to store the assembled object code during assembly. This limits you to about 11.5K of object code per assembly. If more code is produced than will fit into this area, 6510+ will abort the assembly and produce this error message.

SYMBOL TABLE OVERFLOW

The area of memory underneath the Basic ROM ($A000-$BFFF) is used to store the symbol table (list of labels) as the program is assembled.

If the symbol table gets too big for this area then 6510+ will use the area of RAM from $C000-$CFFF but if this is full, the above error message is produced. (This is extremely unlikely to happen though!)

CAN'T NEST

Only one LIB file may be open at a time. This means that any files that are LIBed into the current assembly cannot themselves contain LIB commands. If they do you will get the above message.

This is also produced if a CHN or LNK command is found within a LIBed file.

FILE

When a LIB file is read, 6510+ checks the first two bytes in the file to make sure that the program is actually a source file. If the first two bytes are not 1 and 8 (meaning the program starts at $0801, as source code usually does) then this error is displayed and assembly is aborted.

SYNTAX

This is the general purpose error. It means something is wrong with the current line. It's usually something quite obvious, such as a missing space or missing quote.

BREAK

This is displayed if you press the RUN/STOP key during assembly. It isn't exactly an error, it just indicates that assembly was stopped by you and not because some other error occurred.

BAD LABEL

Labels may only begin with a letter, using a label starting with some other character will produce this error.

TOO COMPLEX

This error is produced if there are too many brackets in an expression and it is another message that should never happen. In tests, I managed to get about 30 pairs of brackets before I got this error. If your expression contains anywhere near that amount then something is seriously wrong with the way you program!

DIVIDE BY ZERO

Fairly self-explanatory this one. Any attempt in an expression to divide by zero will produce this message.

Fig 2: 6510+ in memory

$0801-$71FF This is free for your source code and/or assembled code. Use it as you wish

$7200-$72FF This area is used as a workspace for 6510+. Do not corrupt this area

$7300-$73FF This is where the F-key definitions are stored. Do not corrupt this part of memory (if you want to keep the function key definitions intact, that is)

$7400-$9FFF This area of memory is where the code for 6510+ resides. Corrupting any memory in this area would very probably cause 6510+ to crash

$A000-$CFFF This area, under the Basic ROM, is where the symbol table is stored. Only very large programs will create label tables large enough to extend into the $C000-$CFFF block. You may assemble code to $C000-$CFFF, even if the symbol table does extend into this area (not very likely), although this will corrupt the end of the symbol table (if it *is* that big).

$D000-$FFFF During pass 3 of assembly, the assembled code is placed in this area temporarily. Only when the ASSEMBLY COMPLETE message is displayed is the code moved to where you want it!

And Finally

That seems to be it! I hope I've not left anything out but if you do find something I've not mentioned or something you want explaining, or even, perish the thought, a bug, then feel free to contact me via *Commodore Disk User*. Even better, if you're on Compunet send me an MBX (my ID is DW28).

This might be an opportune moment to mention the fact that all design and programming was done by me (Dave Weaver), with inspiration taken from Supersoft's MIKRO assembler. I hope you enjoy using 6510+.

SID Sequencer

Music to suit all moods and tastes is a keypress away

By Vic Berry

The program can be used to compose three part polyphonic music and experiment with the C64 sound chip (SID). The files that are created can then be saved onto a disk with another program such as a game or a utility program.

The program is written in Basic but the sequencer is a machine code routine which is activated and de-activated by a SYS command from the Basic routine. The machine code consists of two files; the sequencer, and a note reference table which was borrowed from Keith Bowden's book, *The Companion to the Commodore 64*. The Basic program was written with the aid of two utilities published in *Your Commodore* magazine: Input Routines (July 88) by Norman Hart, and many of the screens were designed with Screen Maker by Kevin Otton (Aug 87).

There are a couple of program limitations. The filters cannot be used with Sid Sequencer, but take a look at the sweep filter routine included in the FILTER DEMO. This routine could be incorporated in your own programs. Secondly, a limit of 255 notes can be stored in each of the three channels.

Using The Program

The program will automatically load the two machine code files, if they are not already present in the computer's memory. Then the main menu is displayed on the screen.

Demo Routines

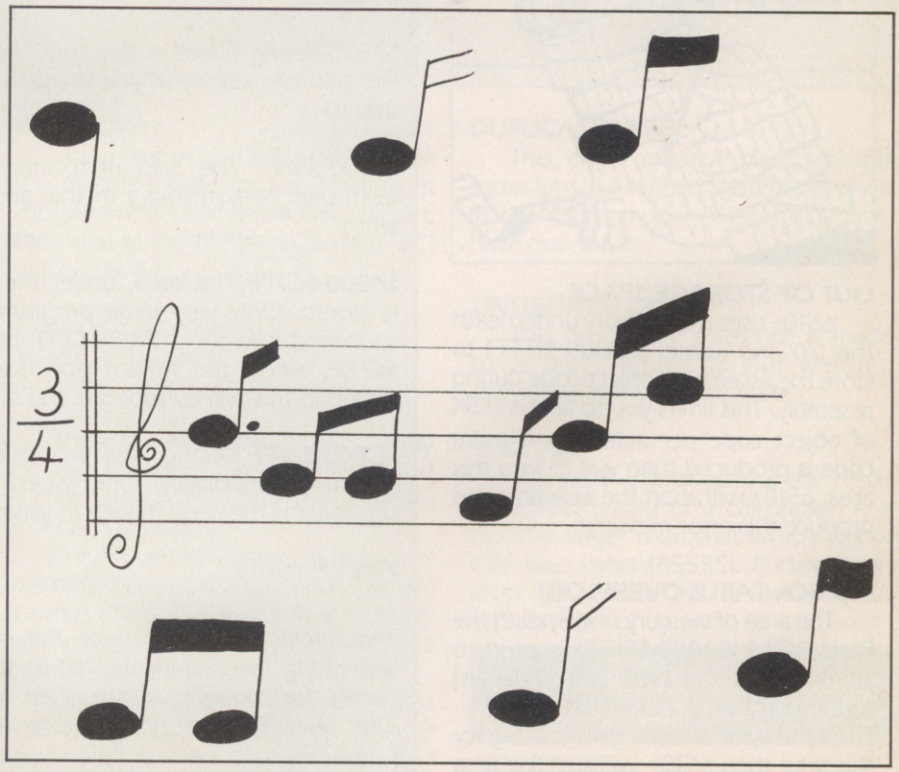
This option loads both the demo music and sound files from the disk, activates the sequencer, and then runs through the main editing screens: Sound editor, Music editor and Play/record mode.

Sound Editor

The waveform shape, envelope and modulation of all the voices can be edited from this screen. The attack, decay and release times of each channel are measured in seconds and milliseconds on-screen, and the sustain is notated as a percentage of the total volume. For details and meanings of the above terms I refer the user to the *C64 Reference Manual*.

The tempo of the music can be increased or decreased. The time values shown on the screen for the music's tempo are only an approximation based on the fact that one interrupt on the C64 lasts for 1/50 of a second. The *Help* function provides details of all the editing controls.

Note Editor

This screen shows a page of music data (64 notes) belonging to the current edit channel. The highlighted note data in the top left corner of the grid shows the position of the cursor. This is where you can delete, replace or insert a note. All the commands are shown by calling up the *Help* function. The note data in each box of the grid is expressed as a musical letter name followed by the octave number. Rests, when a note is not being played, are notated by the letter 'R' and a colon marks the end of the channel data.

Play/Record

The screen shows the typewriter keyboard as a piano keyboard. The piano keyboard is only active when the play or record function is on. When in either of these modes, both the channel and octave are displayed and the user can switch either of them using the function keys. The octave shift keys are marked on this screen with '+' or '-', 8ve is the accepted musical abbrievation for octave. The NTS number shows the number of notes recorded in the current edit channel and is incremented each time a note is pressed on record mode. Owners of a Commodore *SFX Piano Keyboard Overlay* will find the program is compatible and this makes entry of the note data very easy.

Disk Menu

This menu loads or saves a sequential music or sound file with the current filename displayed on the screen. Sound files have the suffix '.S' and music files have the suffix '.1', '.2', or '.3' for

each of the three music channels.

The user has the option of changing the current filename from this menu. The disk command option presents a sub menu where the user has the option of scratching sound or music files, validating or initialising a disk. There is also a disk directory option where only music or sound files are displayed. By moving the cursor to the appropriate filename, the current filename can be changed in preparation for loading a music or sound file. On the directory screen, music files are given the suffix '.M' and sound files are given the suffix '.S'.

Getting Started

To begin with you may like to experiment with the Sound Editor. Select the Demo routine to load the Demo files and this will automatically start playing. To do this press RETURN followed by F3.

Now, you can edit any of the sounds whilst the music continues to play. Press F3 for the *Help* about the various controls and F7 to return to the Sound Editor.

You could try the following to see how altering just a few settings can radically alter both the sound and the flow of the melodies.

To try out all the waveforms just hold down the CTRL key and press 'P', 'S', 'N' and 'T'. Pressing the F1 key will alter the edit channel. The white marker will show you which voice you are currently working on.

When selecting the pulse waveform you can change the sound by altering what is called the duty cycle. This means the actual length of the pulse compared to the total wavelength. This value is expressed as a percentage. If the pulse width is thin (5% or 95%) you will get a reedy sound. A round sound will be obtained as the pulse width approaches a square wave (50%). To alter the duty cycle press 'P' to increase the percentage or press SHIFT and 'P' to decrease it.

To switch synchronisation and ring modulation to the current edit channel on and off, press the CBM key and 'S' for synchronisation and CBM and 'R' for ring modulation. Because of the design of the SID chip it is only possible to use ring modulation with the triangular waveform. Notice when using modulation the notes will change dramatically as well as the sound quality.

Try setting ring modulation and synchronisation to channel 1, and then remove the modulation on channels 2 and 3.

If you want to hear one or two voices on their own, the current edit channel can be switched on and off without loss of data by pressing CTRL and '0'.

More subtle effects can be achieved by experimenting with the envelope shaper. The controls are self explanatory from the *Help* screen. For instance to create a percussive sound like a xylophone, drum or banjo, an almost instant attack of 2 milliseconds followed by a short decay and release time would give the desired effect. Instruments like wind instruments and strings have much longer timings.

To exit the sound editor press F7 and to enter the note editor from the demo routine press F3.

You can experiment by inserting, deleting or replacing notes from this screen. All the channels can be accessed by pressing F1 and an explanation of the control can be obtained by calling the *Help* screen, press F3. Pressing F7 will return to Note Editor.

The editor screen shows only 64 notes at a time, if there are more notes than this in a particular channel it is possible to run through the pages of note data by pressing 'P'. The commands delete, insert and replace work by first moving screen cursor to the point where you wish to either delete, insert or replace a note. Holding the CTRL key and pressing either 'D', 'I' or 'R'. Delete will simply redraw the edit screen with the note removed. Insert or replace mode draws a representation of a piano keyboard for you to select your new note for insertion or replacement.

If you want to delete a whole channel hold CTRL and press 'C' – you have to confirm this option by pressing RETURN. In addition you can reset the sequencer note counters by holding the CTRL key and pressing 'S'. This function is useful if the channels get out of phase when entering music data.

To exit the Note Editor press F7. Now by pressing F3 from the demo routine you will enter the Play/Record mode. The sequencer can be switched on and off by pressing F5 from all the main editing screens. The play and record modes use the same controls, but in record mode the notes are stored and the note counter on the right of the keyboard is incremented each time this occurs.

To enter Play mode press F1 or F3 to enter Record mode. After this, F1 will switch the play/record channel and F3 shifts the keyboard up one octave while F5 shifts the keyboard down one octave. To play or record notes the keyboard diagram on the screen will tell you which keys operate the notes. Rests can be inserted by using the space bar.

To finish play or record mode press F7 and pressing this key again exits from the Play/Record mode.

MUSIC FILES

Calling up the directory from the Disk Menu, you will see there are other music and sound files for you to experiment with or just to listen to.

DUFAY: Many of the pieces have been transcribed from various music scores. Dufay is transcribed from a section of a medieval vocal trio.

TE DEUM: Transcribed from an old book of chorales, the Te Deum required some additional thought to reduce our voice parts to three SID channels. Given this situation it is usual to keep the top and bottom parts (bass and soprano) and merge the two middle parts (alto and tenor) by selecting the most important harmony note (the note that is not duplicated in another part).

BACH SONATA: This is part of the First Solo Cello Sonata. A suitable point in the melody where the music returns to the 'home' note or key (called the tonic by musicians) was chosen for the music to end before looping back to the beginning. On this file the notes were entered into channel 1 and the music file was saved to disk. After exiting from the SID Sequencer, the empty files which normally contain the note data for channels 2 and 3 were scratched. Two copies of the channel 1 file were made onto the disk using the 'CD:' disk command, renaming the files with the appropriate suffixes ".2" and ".3" to create the final music file. Now, by reloading the new file into the SID Sequencer, it was possible to create an echo effect with one of the voices.

Because all the voices in the new file have the same note data, by altering the machine code note counters it is possible to have all the voices starting at a different point in the melody. For instance subtracting a small number from one channel creates an echo; if the number is large a canon or round

can easily be achieved. To do these with your own files it is necessary to break into the SID Sequencer when it is running but not playing, by pressing the RUN/STOP key. If the music is playing when you do this, the counters will still be in operation when you try to alter them. Use the following formula in direct mode before entering CONT.

POKE FSID + (channel-1) *7, PEEK, (FSID +(channel-1) *7) - delay

WEBERN OP.21: This is part of a symphony reduced to just three parts. Luckily, in the first 11 bars there are no more than three notes played simultaneously so complete chords were easily maintained. I have included this file because it illustrates an unusual technique of composing music, called *dodecaphony*.

Dodecaphony means twelve sounds. The bulk of Western music is based on the chromatic twelve notes. Which are in ascending order:

C C D D E F F G G A A B
0 1 2 3 4 5 6 7 8 9 10 11

In dodecaphonic music the 12 notes of the chromatic scale are arranged in any order, then this order is repeated over and over again using different rhythms and voices. The row of pitches can be played singly as a melody or notes can be played together as a chord. Variations of the note row can be obtained by using transpositions, reversing the order of the notes (known by musicians as retrograde), or turning the note row upside down (inversion). For example:

Primary Row
F G G F A A D E C C D B
5 8 7 6 10 9 3 4 0 1 2 11

Transposition (+ 4 modulo 11)
A C B A D D G G E F F C
9 0 11 10 3 2 7 8 4 5 6 1

Retrograde
B D C C E D A A F G G F
11 2 1 0 4 3 9 10 6 7 8 5

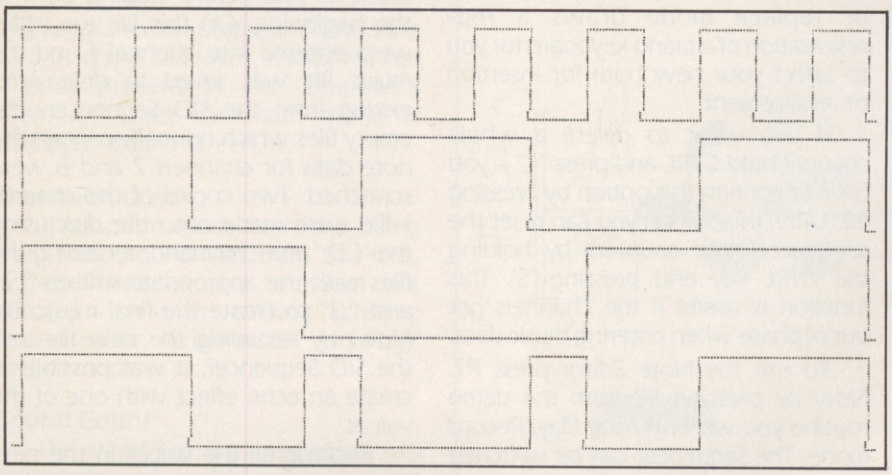
Inversion
F D D E C C G F A A G B
5 2 3 4 0 1 7 6 10 9 8 11

There are 11 tranpositions of the original row as well as 11 transpositions of the retrograde and 11 transpositions of the inversion. An enormous supply of thematic material from just one note row.

Dodecaphonic music is often known as *atonal* music because all the notes have equal priority and no one particular note appears more often than another. Unlike conventional *tonal* (music having a 'home' key note which tends to occur more often than others) the music can have a strange eerie effect to unaccustomed ears.

SCHILLINGER: This is an original piece of music created with the aid of mathematical rules. The rhythms, the phrase lengths and even the pitches used were generated by a number series called periodic synchronisation. This technique is analogous to the interference between two frequencies of different wavelengths.

In this piece of music the numbers to be synchronised were 5 and 3.



3. UNIT: 3: 5:

RESULT: 3+2+1+3+1+2+3

This resultant row can be subdivided into groups to form rhythmic durations, or phrase lengths, imagine a graph where the horizontal axis represents units of time. If the notes of the chromatic scale are numbered in ascending order (see above) this would form the vertical axis of the graph. Groups from the number series can be used to create both a scale and to determine the pitches selected for both the harmony and melody. In the example file I used the following vertical pattern:

C D F F A A (C)
0 3 5 6 9 10 (0 or 12)

Which you can see is a simple summation of the original interference pattern. Put both axes together and you can eventually end up with something like the example file. This technique of composition was first devised by a mathematician called Schillinger and was applied to the visual arts as well as music. If you want to know more about the Schillinger method get his book *The Mathematical Basis of the Arts*.

TRIAD: This file illustrates the use of music data channels of unequal length being played together, the effect of using musical lines of unequal length is to have the music moving in and out of phase with each other. The notes chosen for this piece were simple 'triads' (three note chords) each part would be in a different key and a different tempo or beat. The type of music created by letting the melodies drift in and out of phase has been termed *minimalist* by musicians, having parallels to ancient chants or mantras. The example file is crude when compared to the masters of this type of music namely Steve Reich and Philip Glass. (If you can get a chance to listen to *Violin Phase for Violin and Multitrack Tape* by Steve Reich you will hear exactly what I mean).

It is interesting to note that even this simple music file, comprising of just three voices with less than 200 notes in each, takes nearly four days before the music starts to repeat and the sequencer's counters all return to the starting point.

One note = t
t=0.24 secs

Channel 1=134t
Channel 2=124t
Channel 3=165t

Common products = 134t x 124t x 165 t

=2,741,640t

134 & 124 divisible by 2 therefore
Common product = 1,370,820t

Therefore Time T=328,997 secs.
T=3.8 days.

Each of the music files I have included with this program illustrates different techniques of writing or thinking about music. Music is very much like a language having different rules of construction, vocabularies and dialects. It is possible to create music from any system of rules of your own choosing, you could even devise a program to write music files directly to a disk to be loaded into DIS Sequencer based on your own set of rules such as probabilities or mathematical equations.

Creating Code

To create a program that will run alongside a game or utility you must copy the sequencer, the note table, and the data for the three channels using a machine code monitor. First you must start your program with the following lines:

```
10 A=A+1:IF A=1 THEN LOAD"SEQUE
NCER.MC",8,1
20 IF A=2 THEN LOAD"NOTE TABLE.
MC",8,1
30 IF A=3 THEN LOAD"MUSIC.MC",8
,1
40 SYS49239:REM MUSIC ON
50 REM INSERT REST OF YOUR OWN
PROGRAM
.
.
.
999 END:REM SYS 49209 TO STOP M
USIC
```

After amending and saving your program to disk you are ready to save the machine code file.

Having loaded or finished your music from within the SID Sequencer program you should exit the program and load a machine code monitor into the computer's memory. Make sure the monitor does not use any of the locations $C000 to $CFFF. Then you can save the following blocks of code.

"SEQUENCER.MC" $C000 – $C108
"NOTE TABLE.MC" $CA00 – $CAFF
"MUSIC.MC" $CB00 – $CDFF

Your program should now be ready for use.

Music can add to the atmosphere of a game and SID Sequencer provides a suitable meduim to gain the best from Commodore's excellent sound chip.

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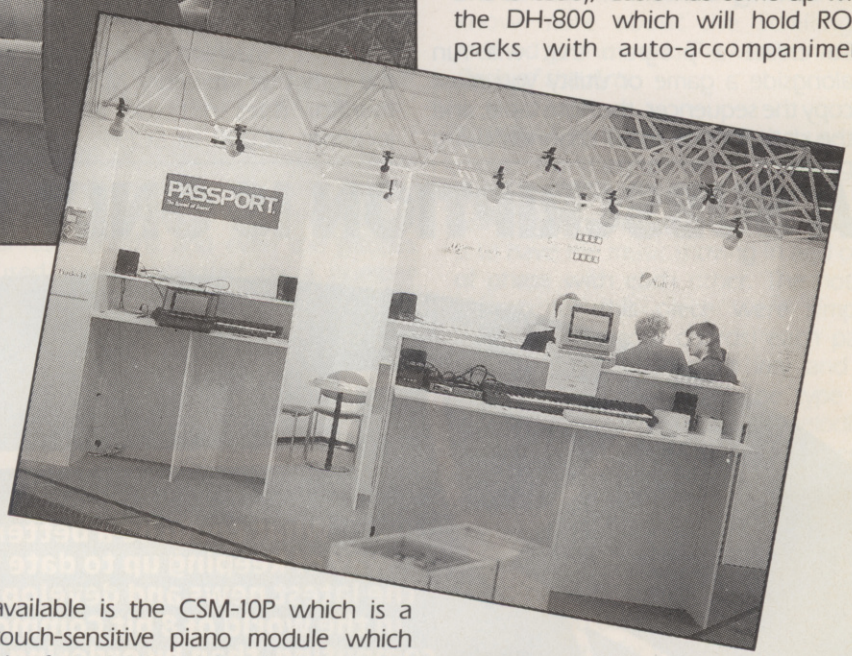
BARCLAYCARD VISA

Hot Dog: The Frankfurt Show

Does life exist beyond the SID chip?

By Kevin Crosby



Every year the music industry's attention focuses on the town of Frankfurt for the International Music Messe – Europe's premier showcase for new products in the music field.

The show itself was ENORMOUS – four floors, each the size of Earl's Court, spread across two interconnected buildings. Despite the odds against it, I managed to see *all* the new products from the major manufacturers, which will be hitting our shores during the next year, plus some exciting products from companies as yet unknown over here.

Not surprisingly all the major hardware manufacturers were there displaying new products or upgraded versions of existing bestsellers.

Casio had some rather nice products in their '89 range. Most significant of these was the launch of a series of rack-mounted sound expanders with multi-timbral capabilities.

At one end of the price range we have the CSM-1 which features 16-voice polyphony and four timbres at any one time. The unit features 100 presets (28 instruments, 23 effects and 49 PCM drum sounds.) All for just £179. Also available is the CSM-10P which is a touch-sensitive piano module which also features harpsichord, vibraphone, electric piano and pipe organ. Price: £229.

Casio is not, however, content producing portable keyboard-style sound units. The company is now waging war in the pro-quality rack synth market – as well with the VZ-8M. This unit features eight-voice polyphony plus eight timbres at any one time. Sounds familiar so far but this module also features keyboard, guitar and wind modes which alter some of the performance parameters to cater for whichever MIDI controller you happen to be using. The VZ-8M also has a comprehensive panning utility which allows you to fix where the stereo image of your sounds are, or use the unit as an auto panner. RAM cards will be available and the unit is totally programmable and costs less than £500.

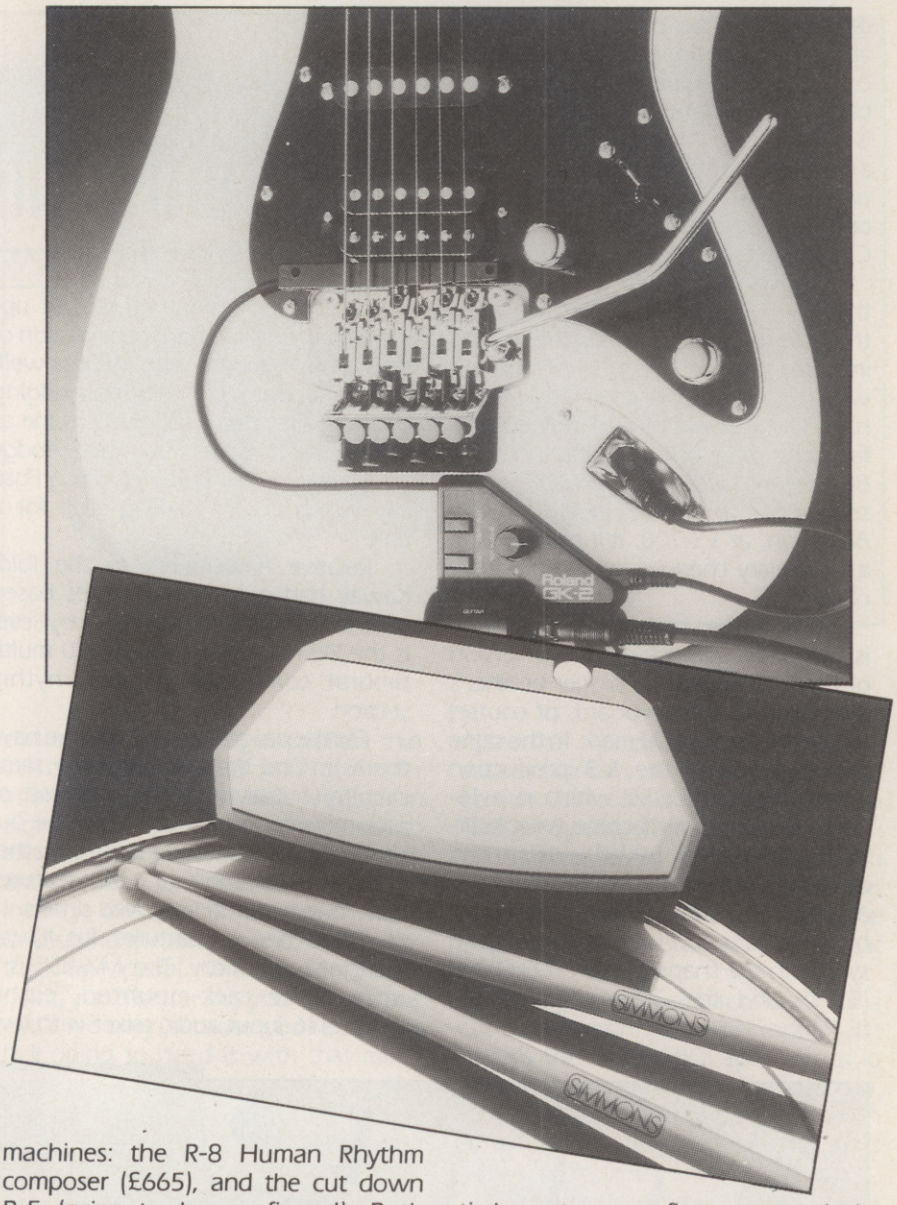
For the semi-pro's, Casio has come up with an upgraded version of its rack-mounted sampler. The FZ-20M features everything the FZ-10M had but also includes a SCSI port so you can hook up a Hard drive, which makes life much easier for sample users. Not cheap but certainly good value at £1,899.

Not content with the success of the DH-100 Digital Horn (*see the review in this issue*), Casio has come up with the DH-800 which will hold ROM packs with auto-accompaniment parameters. If the DH-100 wasn't the ultimate in busker's instruments the DH-800 surely must be.

All the above products from Casio should be available by the time you read this, although the VZ-8M and the FZ-20M will be in short apply initially.

The Roland line-up included the W-30 Music Workstation which has a five-octave aftertouch sensitive keyboard with built-in 16-track sequencer and 16-bit sampler with 3.5 inch disk drive, all in one box for £1,600.

Also launched were two new master keyboards: the A-80 and A-50. Both feature four indpendent user-definable zones which have their own



MIDI channel, key range, program change and controller parameters. Traditional modulation and pitch bend wheels are provided as well as Roland's own toggled modulation set-up, two MIDI INs (mergeable), one MIDI THRU and four MIDI OUTs, and 64 patch internal memories which can be dumped down on to RAM card for storage. The A-50 costs £1,395 and has a six-octave keyboard while the A-80, at £1,599, has seven octaves of piano, weighted keys.

For guitarists there is the GK-2 synth driver for £110 which fits on to any guitar and allows you to drive the GR-50 guitar synth module (£799). For the guitar purists there's the GS-6 which is a digital guitar pre-amp and signal processor, all in one box for £560. This 1U high piece of rack-mounted module also incorporates hum canceller and noise suppression, so expect to hear some very clean guitar sounds in the future.

Roland has two new drum machines: the R-8 Human Rhythm composer (£665), and the cut down R-5 (price to be confirmed). Both feature sampled sounds which are combined with human feel parameters (variations in timing and velocity). Three additional ROM cards are available containing Contemporary percussion, 'jazz brush' and sound effects. More cards are planned including the best of the older Roland beat boxes like the TR-808.

Those of us on a tight budget have not been forgotten either with the launch of the D-5, which is a D-110 sound module and a five-octave velocity sensitive keyboard all for £599.

Yamaha decided to have its stand in a different hall to the other synth manufacturers. For some reason it was in the same place as the bongo drums and tubas.

Nevertheless Yamaha did have some rather nice products to show off including the V-50 workstation. This features 16-voice polyphony, eight timbres at once, a five-octave, velocity and pressure-sensitive keyboard, plus 61 sampled drum sounds, an eight-track sequencer, and digital effects and disk drive built in, for £1,239.

The coupling of synth and sequencer circuitry also comes together in the shape of the budget-priced TQ-5 FM tone generator (£499). This has 100 internal sounds plus eight-track sequencer, again, all in one box.

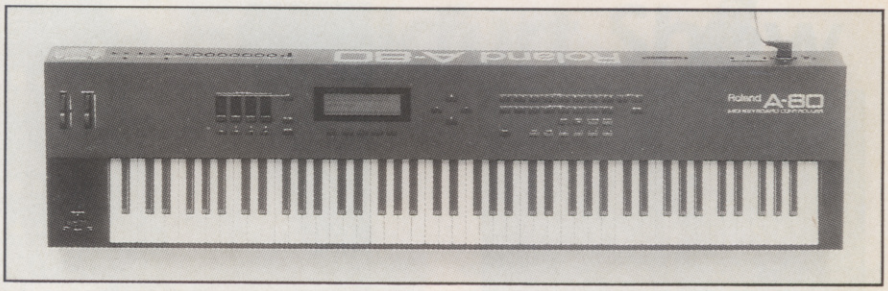
The company also launched a new mid-priced – £399 drum machine in the shape of the RX-8. Sporting 43 16-bit samples, the unit also has four audio outputs and, of course, all data can be dumped on to tape or RAM card.

Rounding off Yamaha's items of interest were two effects units. The SPX-900 and the SPX-1000. Both offer all the effects we come to expect from Yamaha (reverb, delay, flange, phase and chorus) as well as small-scale sampling and the likes of compression,

distortion and aural exciting. The 900 also has an optional infra-red remote control which gives you a duplicate bank of front panel controls. The 1000 is the flagship of Yamaha's effect range and features some rather impressive two-channel effects that change from one effect to another, from left to right. Clever stuff.

Following on from the success of the M-1 workstation, Korg has taken the everything-in-one-box ethic and implemented it in a number of different ways. At the top end of the line we have the T-1 which is a refined M-1 featuring more of everything including 88 weighted keys, a 56,000 event sequencer and built-in disk drive. Although, at £3,700, it'll probably be a few salary cheques away from most of us.

At the other end of the price range is the M-1R – a rack-mounted version of the M-1 with all its bigger brother's features (bar the keyboard, of course) for around the £1,300 mark. In the same price bracket is the S-3 production workstation at £1,150 which is a 16-bit sampled drum machine with built-in digital effects (reverb, delay and chorus), eight-track MIDI sequencer and SMPTE timecode generator. Korg has also come up with a guitar synth system in the shape of the Z-D3 Driver (£179), and the Z-3 synth module, (£799).



of the PSS-60. It's rather like an up-market auto-accompaniment section of a portable keyboard with MIDI as well, and is priced at £827. Mind you judging by the leaflet that was given to me at the show, it either has some dodgy translation or the unit includes a Pose key which is "for making stop for a time."

Relative newcomers to the fold, Kawai, had quite a few boxes based on the K-1 architecture. At entry level is the PH-m, 200K-1 presets, 50 multi-timbral combinations plus rhythm section.

On the programmable side we have the K-1m and the K-1r. Both the same circuitry but available in desk-top or rack-mounted versions. Not to be out shone the K-1 also has a bigger brother in the shape of the K-1II which features built-in reverb and improved drums.

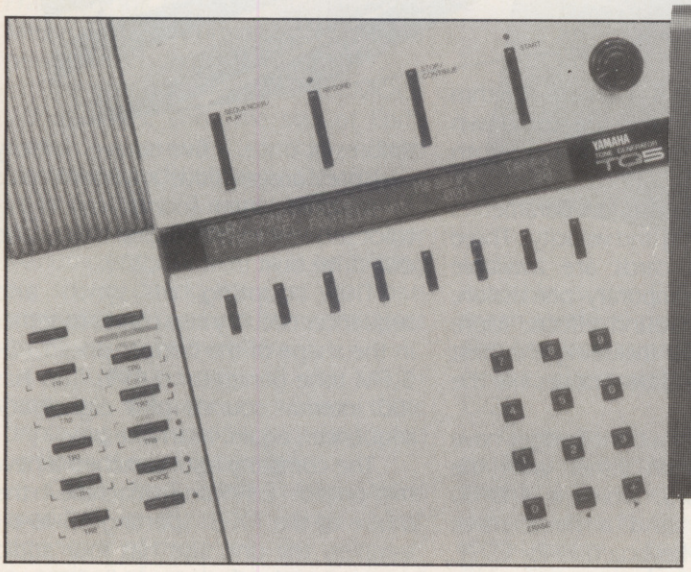
Three new departures for Kawai were also on show. The MX-8SR is a rather nice rack-mounted, eight-channel 16-input audio mixer with two

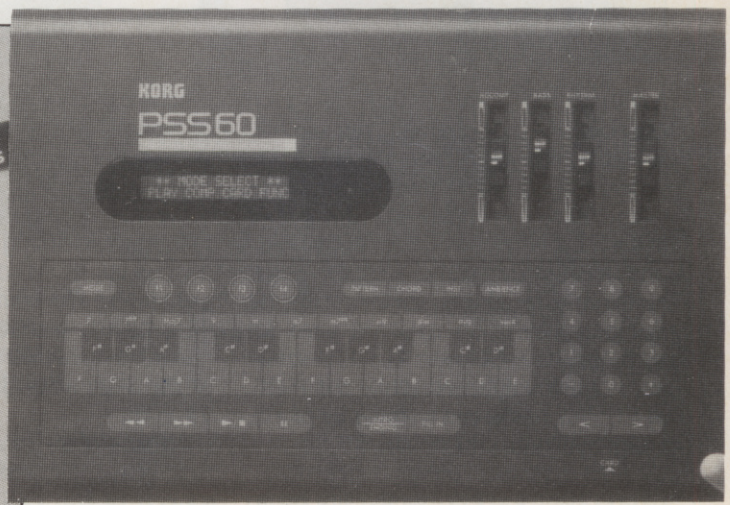
are neatly positioned round the back, with the exception of one IN and one OUT at the front, in case you still need to plug things in and out, as I do. And the price of this is a mere £99.

Finally from Kawai is the KML-SG Group Lesson system. This is an audio and MIDI-based monitoring system, designed with the educational market in mind.

That sage of the signal processing world, Alesis, had a new string to its bow on display. This was a 16-inch stereo-out audio mixer with six auxiliary sends and four stereo returns. Thanks to the newly developed Integrated Monotlithic Surface technology, this rack-mountable mixer should be one of the quietest affordable mixers on the market. Price is to be confirmed, but looks like it should be under the £800 mark.

Fans of the HR-16 drum machine will no doubt be interested in the launch of the HR-16B. Same drum machine, same price, about £350, but





With the studio in mind, there's the A-3 multi-effect processor which allows you to chain six digital effects together. Parameters can be edited and stored internally or on RAM card for later use. The PMZE of this little unit is £950.

For the one-man bands Korg has resurrected an old idea in the shape

auxiliary sends and a stereo output, and all in a 2U high space. The thinking behind it was that as most synths and drum machines were stereo it made sense to pair up inputs. On the MIDI utilities front Kawai has produced the MAV-8 MIDI patchbay – a four-IN-eight OUT MIDI matrix. All the sockets

a new bank of 49 sounds at your disposal. The emphasis this time is on composite samples with as many as five different drums and effects on any one sound. The sounds are great as an additional aresenal but if you want the bog standard kits you would need another drum machine of multi-voice sampler to provide them.

There wasn't an incredible amount new on the Akai stand. There were

some software updates for the S-1000 sampler, which allow time stretching and up to 16 voices in memory, and new software for the Akai/Roger Linn production centre. Yes you've guessed it, workstation software.

For those of you wanting to get into multi-track on a tight budget, Akai might just have the answer. The U-5 Trackman is a walkman-style unit which plays on tracks three and four. Furthermore the unit has built-in echo, chorus and distortion. Should retail for about £199.

Dynacord continues to amaze the old boys of the industry with its ever-increasing range of hi-tech equipment. Causing the most interest was the new range of 16/20-bit samplers which not only read Akai S-900 disks but also – according to several people I met sound better than the S-1000, particularly on quieter sounds. There's a keyboard and a rack-mount version with an optional hard disk available for both. It also has an in-built eight-in-eight out mixer with six auxiliary sends. How long before they come out with, dare I say it, a workstation!

Not being one to rest on its laurels, the leading lights in electronic percussion, Simmons, has come up with a new range of trigger interfaces. This includes the ADT – a new, improved audio to MIDI interface for £450 plus a workstation (argghh!) for which looks a little like a MacDonalds cashpoint but costs considerably more, at £5645!

The Portakit, a 12-pad triggering unit that's set out in much the same way as a traditional kit, should prove a worthwhile addition to any die hard rhythm purists out there, especially as it's less that £500, and now includes a bracket and stand. Very thoughtful guys! In a similar vein are the Drum Huggers – small electronic pads that perch on the edge of conventional drums. The Drum Hugger master unit plus four slaves costs about £320.

Lake Butler Sound (distributed in the UK by Dixie's Music, Huddersfield) has produced a couple of MIDI foot controllers aimed at guitarists but of equal use to any musician with his or her hands full. The RFC-1 allows you to send any MIDI information you like across any, or all, of the 16 MIDI channels at the press of a footswitch. It will store 128 of these internally and can also rearrange them into three different set lists. Very handy for live use.

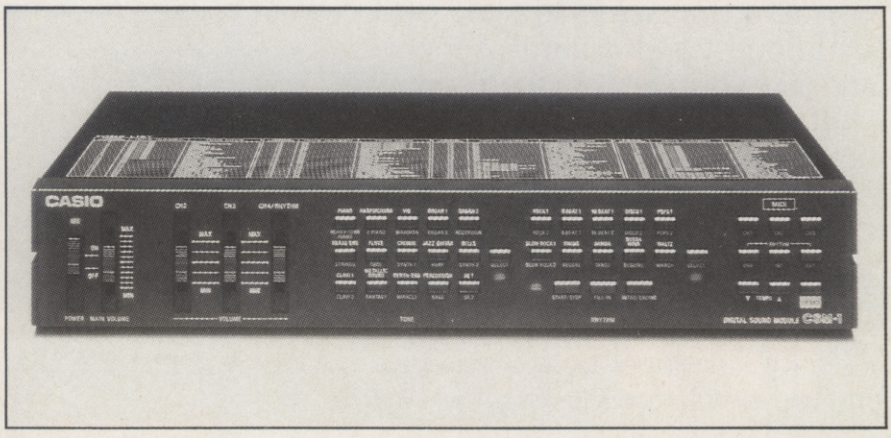
The CFC-4 has a slightly different approach. This is a set of four continuous foot-pedal controllers that can be assigned to alter MIDI controller information. You can also program in eight different response curves which allow you to blend from one effect to another. So, for instance, you could increase the rate of modulation while decreasing the level of aftertouch, with the same pedal. With four of those going you'd better buy your micro some extra memory because you're sure as hell going to need it with that much controller information going into your sequencer.

If you're a saxophone player and wind controllers leave you cold, then maybe Swiss company Softwind has just what you're looking for: a genuine Yamaha alto sax with a full MIDI retrofit for about £2,000. The tracking is excellent, and modulation and pitch bend can be controlled accurately by manipulating the reed. Sounds incredible, but it's true.

Californian company, Zeta Music Systems, specialises in MIDIing accoustic instruments and has released version 2.0 software for its Mirror 6 Guitar Synth. This implements six continuous MIDI controllers which include an 'accelerometer' motion sensing device that allows you to create various effects by shaking your guitar around.

Also just released from Zeta, is a cut-down version of the Mirror 6 which retains the same MIDI spec by using cheaper pick-ups and no tremolo. Incidentally, there is also a MIDI violin retrofit available from these guys which, to my knowledge, is unique.

The final mention goes to a Hertfordshire-based company, MTR, which has two new products on the market. These are the PM21 MIDI patchably and the Soft Rak flight bags that allow safe and comfortable portability for rack-mount gear. MTR also stocks a range from the American firm, ARX Systems.



Liberté

Can you escape from the top security P.O.W camp that you find yourself in. Help the Resistance to destroy the Gestapo HQ and find your way home.

By Paul A. Eves

Back in the early days of the 64, adventures had a large following. The big problem with writing adventures however, was the large amounts of memory required for the text. All sorts of techniques were employed to overcome this. One day, a software house called *Gilsoft* produced an excellent program called *The Quill*. Suddenly, the world opened up to all sorts of adventures. Unfortunately, like the *SEUCK* system, people did not really use it to its full potential. Liberté is one of my offerings. Please remember, this program was originally written nearly five years ago...

Liberté employs the usual verb, noun input but you can use extend commands for effect. For example, you can say either 'Take gun' or 'Take the large machine gun'.

The scene is a prisoner of war camp in France. Your job is to use cunning and stealth to break out of the camp. Once safely outside, however, your task is not over because, to succeed in your escape, you are required to join up with the Resistance and help them destroy the local Gestapo HQ.

All your powers of concealment will be required to complete your mission, for during the day and night, German patrols roam the countryside at random. Do not get picked up more than once – you will not be able to carry out your escape if you are. (Hint).

As in real life, it sometimes helps to be in the right place at the right time and it always pays to have a good look around first. (More hints)...

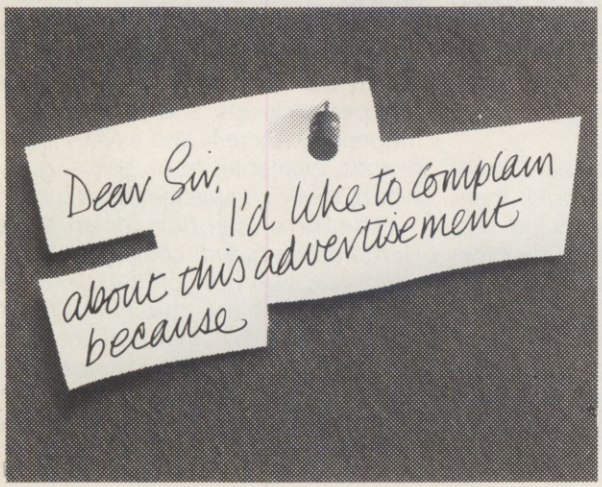
As is standard on all adventure games there is a save game option.

Good luck to you, may you be successful.

More Hints

In addition to the standard commands found in most adventures (N, S, E), you may find this list of some of the unusual ones of assistance.

Enter, Exit, Out, Say, Throw, Set, Hide, Board, Shift, Fix, Secure, Cut, Fill, Blacken, and above all, brush up your French.



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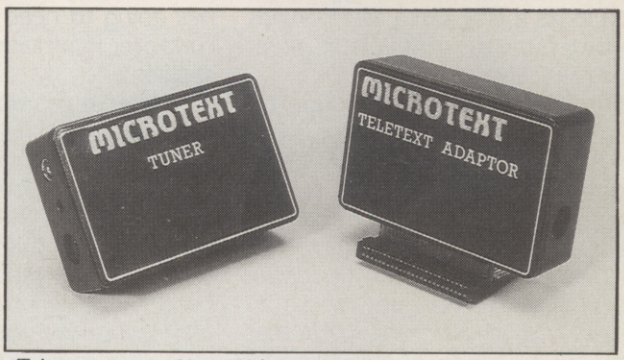

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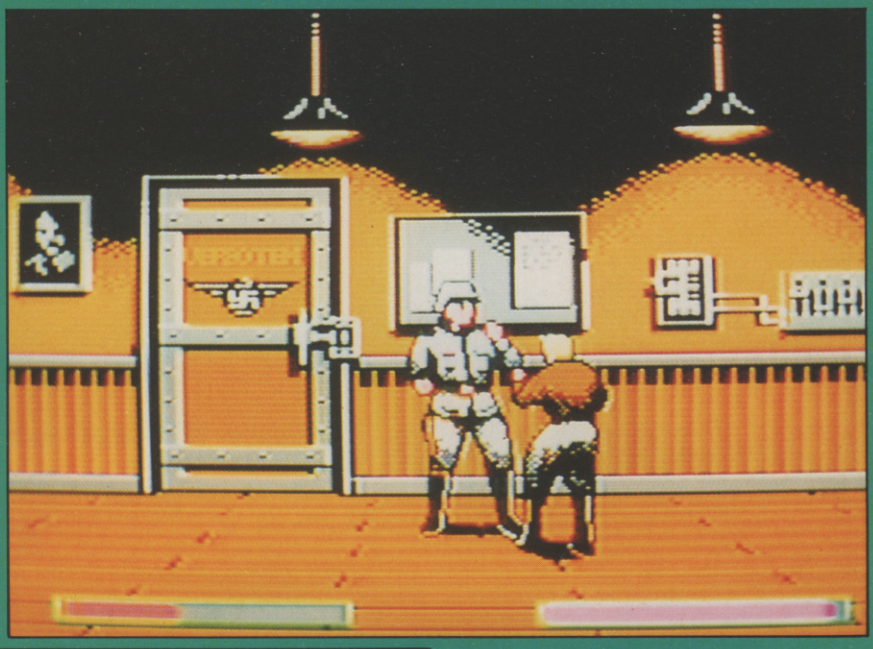
Reviews

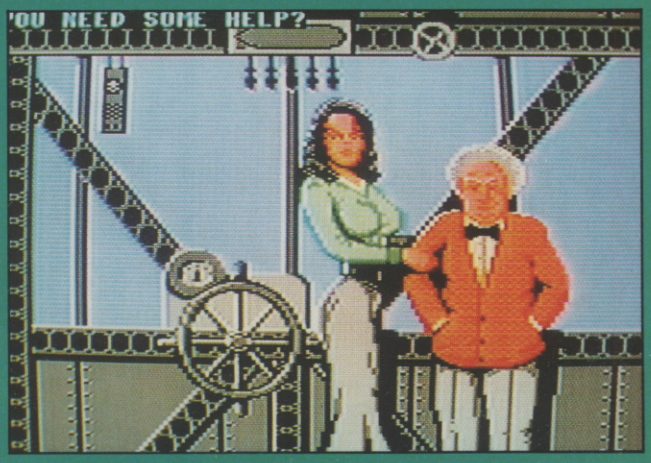
Rocket Ranger



The year is 1940, the place is Fort Dix, USA. In a laboratory, you are working on your latest research project while Europe is at war. But your concentration is broken by the mysterious arrival of a rocket pack, ray gun, decoder wheel, wrist terminal and secret notes that have been sent through time by an underground group of scientists. The scientists are in a future dominated by the Nazi war machine that has become too strong to be defeated and has crushed all before it. In a last desperate chance they turn to you and hope you will use the equipment to become Rocket Ranger and save the day by defeating Nazism in its infancy. You'd better hurry because the Nazi hordes are already sweeping across Europe and they have somehow engineered a dramatic leap in technology and are using the fuel lunarium to power giant zeppelins of destruction. As its name suggests, lunarium is mined on the moon and is being ferried back to Earth by Nazi rockets. Your task is to build and fuel a rocket of your own so that you can destroy the moon base.

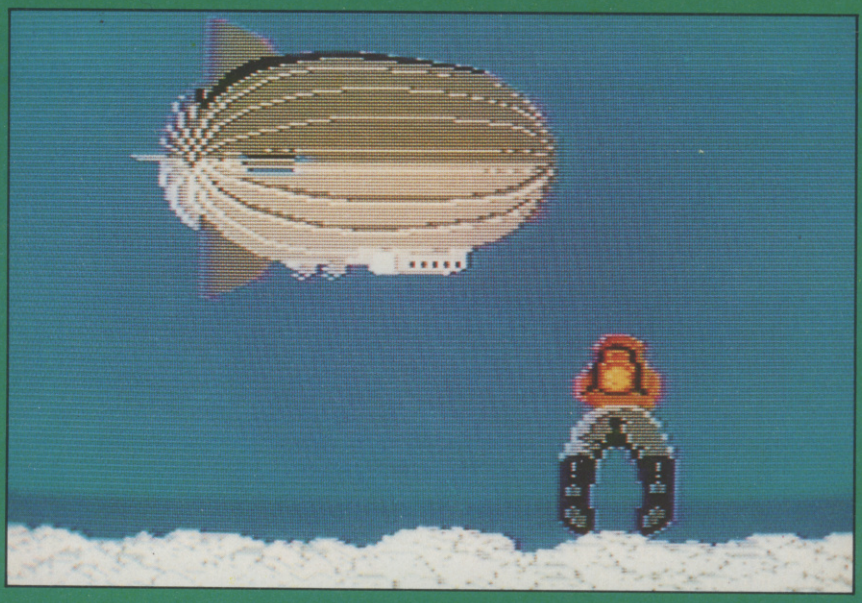
Naturally, the Germans are keen to keep these bases hidden so you have to organise your team of global agents to find them. This is, of course, a highly dangerous mission and they will be shot if they are discovered. You can decide whether they will operate in a high risk area to get fast results or run a slower but safer operation. Either way, they will report back their findings and can then be moved on to another region or given orders to organise local resistance. Resistance groups can slow down the rate at which the Nazi war machine spreads but they can also raid the fuel dumps to send back valuable lunarium to fuel your rocket and power your rocket pack.

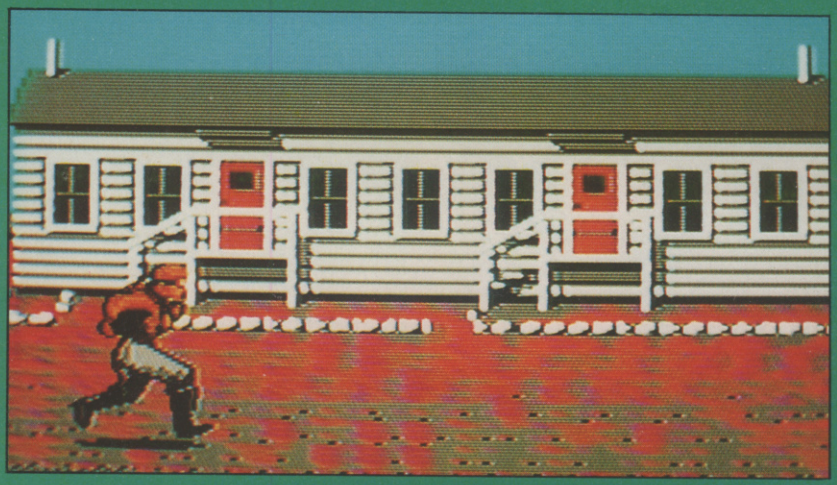
Whenever an agent finds a German bomb factory, rocket factory or fuel base, it's your job to try and raid or destroy it. This will take you into battle with armed zeppelins, dogfighting ME109s, into the sights of anti-aircraft guns, and fist fights with German guards. While all this is going on, the Germans make numerous attempts to kidnap the brilliant Professor Barnstorf and his daughter Jane who they will



use to increase the efficiency of their army and the speed of conquest.

You get three attempts to rescue the prisoners but each mission is more dangerous and takes up time that you need to organise agents and raid rocket bases. Your first rescue attempt happens high over the Atlantic Ocean as you try and shoot the German guards without blowing up the explosive airship. Once aboard, your problems have only started because you must convince Barnstorf and Jane to let you fly them back to Ford Dix. This can catch the unwary player off-guard because Jane actually asks you questions through digitised speech and you must answer by selecting the appropriate option from a menu. If you say the wrong thing, they will throw you out and head for Germany.





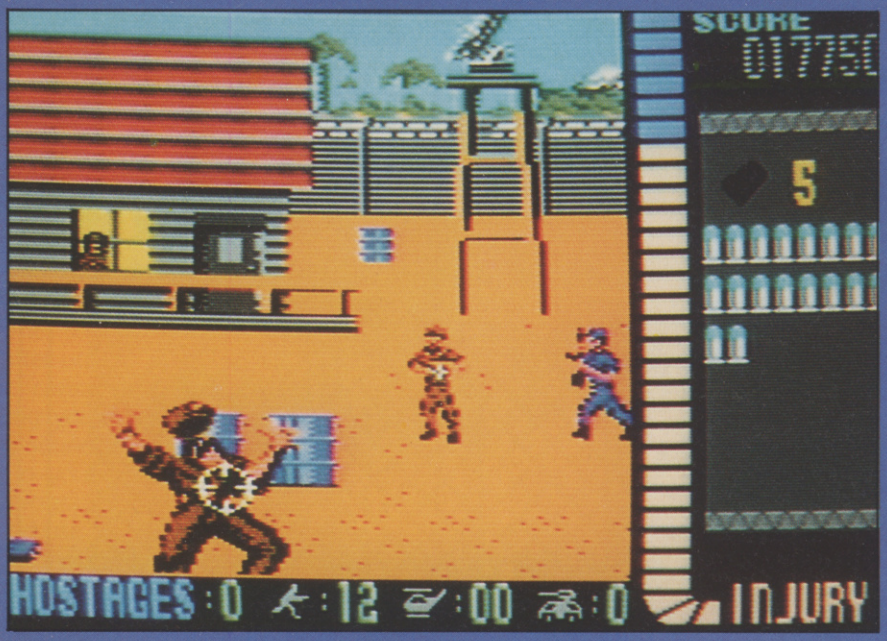
Next you run the gauntlet against a squadron of ME109s, only to be captured in the end. Luckily, you're put in the same cell as the professor and so you get a second chance to convince them and plan your escape. If you fail again, you have one final chance to win them over at a secret desert base before they are flown to the moon. By now, things will be desperate as Nazi efficency will have shot up from 50% to 90% and time will be running out for you and the world. Even if you manage to save them you can be sure the Nazis will try again.

To succeed in Rocket Ranger you will have to learn how to use the code wheel to select the correct amount of fuel for your desired destination. Then you have to master using the rocket pack for take-off which involves running until Rocket Man reaches launch speed. Naturally, the more fuel you are trying to carry the faster you need to run. Eventually, you find and capture the five rocket parts that you need to build the rocket. At this point you should have collected 200 units of lunarium to fuel the journey to the moon to do battle with the crazed Nazi Zombie Women and save the world.

Rocket Ranger is the best Cinemaware game to date and even outshines *Defender of the Crown*. It offers its players a combination of strategy and arcade action, superb graphics, a stirring soundtrack and digitised speech.

At a glance

Title: Rocket Ranger
Supplier: Cinemaware (Mirrorsoft), Athene House, 66-73 Shoe Lane, London EC4P 4AB
Price: £14.95
Graphics: Excellent
Sound: stirring stuff.
Playability: easy to learn
Addictiveness: Rocket Ranger to the rescue!



Operation Wolf

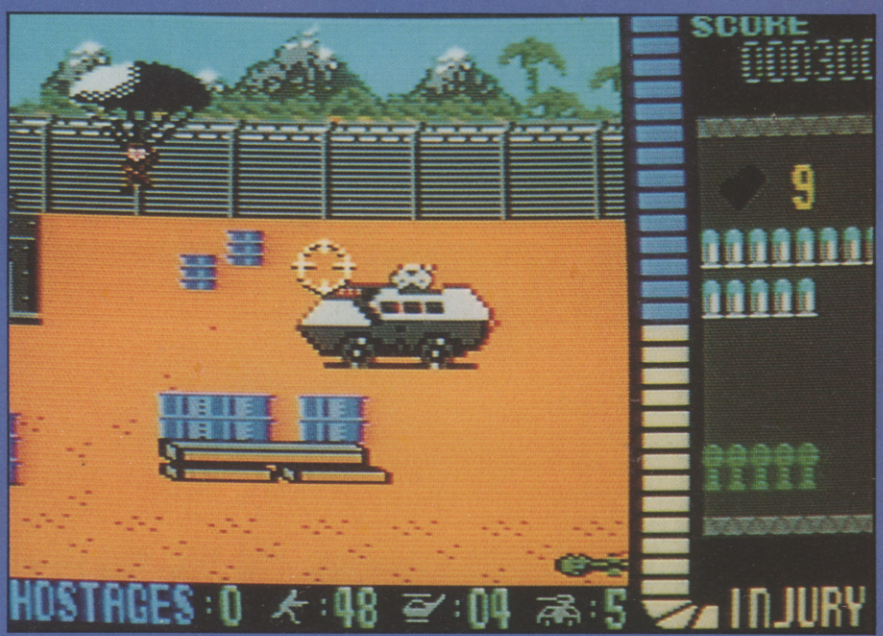
When I was but knee high to a hedge hopper, I used to spend hours lining up row upon row of toy soldiers and then a few mindless seconds knocking them all over with marbles. For some strange reason, playing Operation Wolf from Ocean brought back memories of those long forgotten days.

Operation Wolf was one of the arcade smash hits of 1988 and this conversion is much better than the fare normally served up. Armed only with a machine gun and fistful of rockets, you have to blast your way through six separate stages as you attempt a one man rescue mission on a prisoner of war camp. If you do manage to release the prisoners (stage 5), you must ensure that they all get aboard the rescue plane in the final stage.

Each stage is a horizontally scrolling section filled with an assortment of gun toting baddies. Throw in a few helicopters, tanks, parachutists and gun boats and you will soon realise that yours is no easy task.

Two further problems complicate matters. Having sent you on this one man suicide mission, your government has decided to be decidedly stingy when it comes to supplying you with ammunition. This means that you can not keep your finger firmly pressed on the fire button blowing away everything that moves. There is extra ammo to be gained by shooting at specific targets but you always have to engage your brain before your trigger finger. Large targets such as tanks and choppers can be taken out either with a missile or by concentrated machine gun fire.

Targetting is your second problem. Joystick control takes some getting used to and you will find that for the first few games you are miles away from what you want to hit. For this reason, there is also a mouse option which a lot of players might prefer. As ever though, there is a catch. If you choose to use the mouse, then you get even less ammunition to start with. As you progress through the game, so your aim has to improve further – the baddies start wearing bullet proof vests!

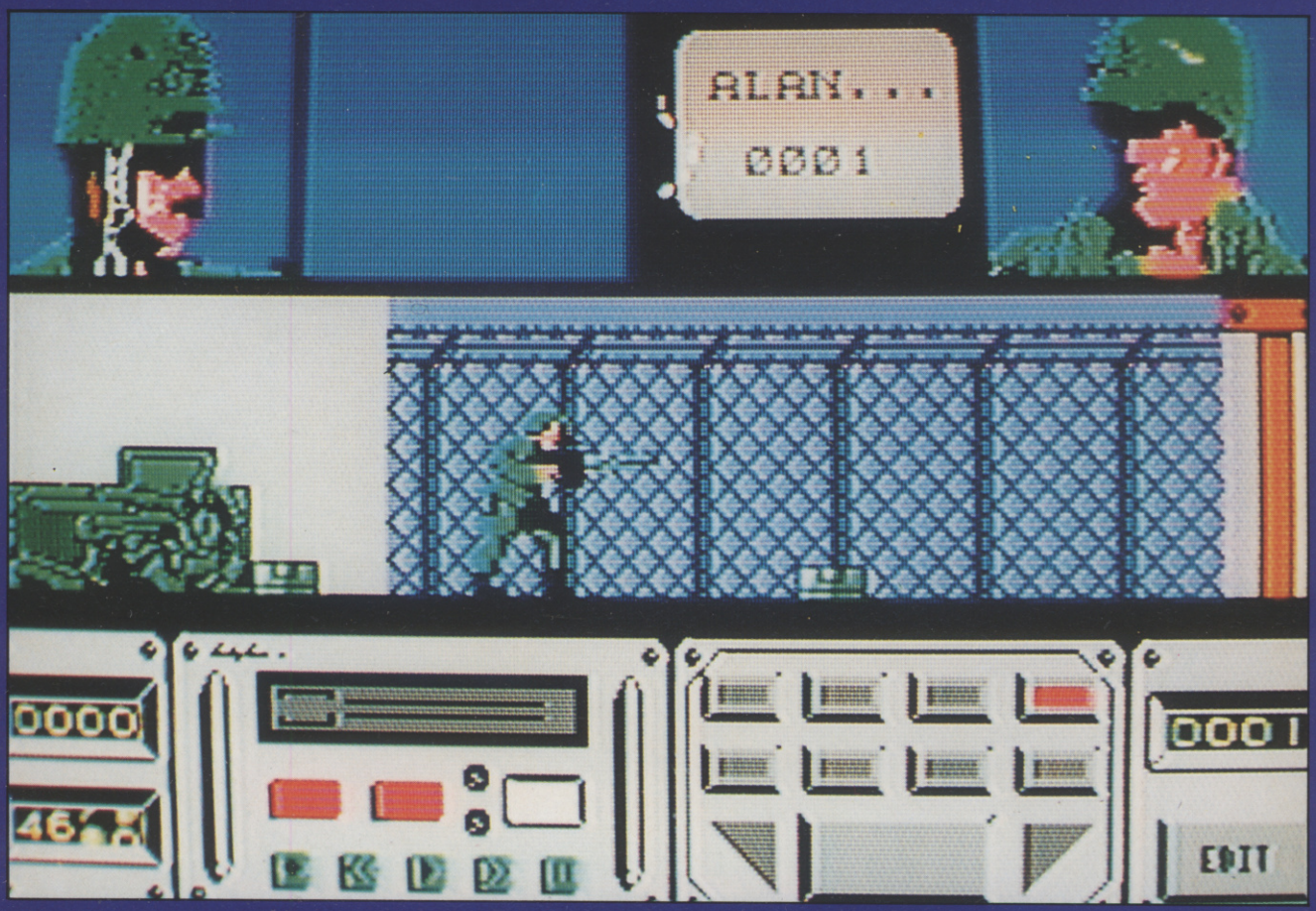


Your own health is monitored by a damage meter. Surprisingly, you suffer more wounds not from being shot by the enemy but by accidentally shooting at the wrong target such as nurses carrying stretchers. Shooting bottles of medicine lying on the ground reduces your damage level.

Operation Wolf was never going to appeal to those who pride themselves on their IQ levels but if you are fed up of zapping aliens and are looking for something else to shoot, this is likely to be just the thing.

At a glance

Title: Operation Wolf
Supplier: Ocean
Price: £14.95
Graphics: Remarkably true to the arcade version
Sound: Lots of snap, crackle and pop
Playability: Highly addictive wanton destruction
Addictiveness: Will appeal more to Rambos than Pattons



Action Service

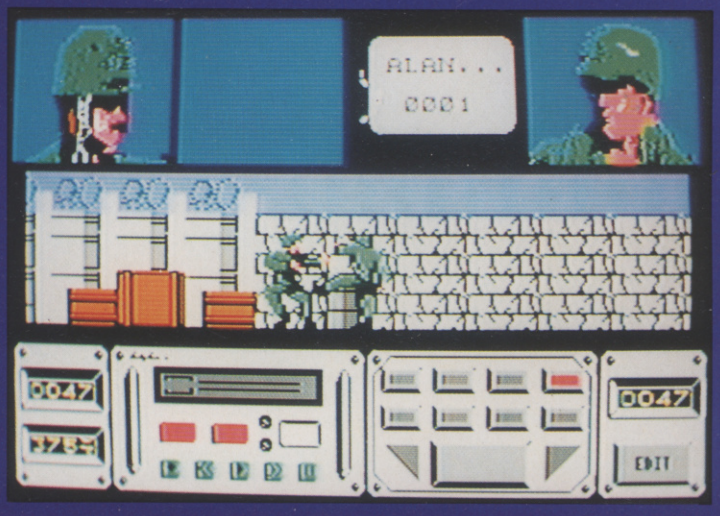
Somewhere in Europe lies a top-secret training school where soldiers test themselves on a course designed to break them. Should they succeed, a place in the elite Cobra Squad waits as a reward.

If you hadn't guessed already, you are about to enter this training centre as a raw recruit and compete against up to 12 of your friends on a course that will test your nerve, skill, reactions and patience. The problem with this game is that the course is just too long and would have been better as a series of shorter challenges. As it is, you have to walk, run, jump and crawl over very repetitive terrain for what seems like hours.

You do have a choice of how you will face the course and whether you would prefer a purely physical challenge or one involving shooting – with, or without, punching and kicking. You may decide to have a combination of all three (wow!) or you can even design your own course.

The course itself is a sideways-scrolling landscape lined with collections of objects that you have to leap over and pipes to crawl through while an instructor keeps you on your toes by firing a machine gun at you, sending in troops to punch and shoot you or even letting loose a dog to bite you.

By now you have probably guessed that I didn't like it. It's slow and repetitive but its worst fault is that it could have been so much better.



At a glance

Title: Action Service.
Supplier: Cobra Soft (Infogrames), Mitre House, Abbey Road, Enfield, EN1 2RQ.
Price: £14.95
Graphics: Quite good
Sound: Poor
Playability: Slow and repetitive
Addictiveness: None at all

The Sound FX Kit

Invent all the effects you can handle with this utility.

By N. Higgins

The Sound FX Kit is an example of one of the most sought-after utilities for the Commodore 64. It contains a host of features enabling you to Produce commercial quality sound effects, and incorporate them in your own Basic or machine code programs, but it can also be put to good use by musicians new to the C64 who wish to experiment with the sound chip.

If you want to hear the type of effects the Kit is capable of producing then load up the disks demonstration program. Press any key from A-Z to hear one of the effects.

The main objective of the program is to create effects for your own use, but it also has a lot of other features. Just to whet your appetite, it includes such things as slider controls, disk or tape option, an FX storage library, a 3-voice mixer, output to printer, and it can even make sound effects for you. To get the most from the kit read the instructions for tube extras. Addtional information on the C64 sound chip would also boost your understanding.

Getting Started

First of all, plug a joystick into Port 2. To select an option simply move the flashing cursor to its corresponding box and press fire. On some options you might be required to push the joystick up or down (as well as using the fire button) to increment or decrement a value respectively, in which case, when that option is described, its title will also contain the suffix (u/d). Alternatively, for those without a joystick I have incorporated the following keys which mimic the joystick actions:-

(Cursors) – same as joystick up, down, left and right.
(Return) – same as joystick firebutton
(Z) – same as fire + up
(X) – same as fire + down

As a joystick was used when designing the Kit, most prompts will ask you to press fire, keyboard users should ignore this and press RETURN instead. Note, you can get a list of all keyboard actions at any time, by pressing 'H' on the main menu.

The main menu

Edit/Play FX This takes you to the main part of the FX Kit, where each sound is developed and tested. Along the top of the screen is a set of slider controls, from left to right these represent Attack, Decay, Sustain, Release, Frequency High (2 sliders for each nibble), Frequency Low (2 sliders), and the Pulse rate (left slider for high pulse and the right slider for low). To alter a setting use the joystick (u/d) feature described earlier.

Each slider can hold a value from 0-15 (or$00-$0F) and this can be calculated from the horizontal lines.

Below the sliders, on the right, is the current Waveform (u/d) this can be set to any of the available four, which are triangle, sawtooth, pulse, and noise. Following this, in brackets, letters may appear which mean the following:

(G) Turns the Gate bit on
(S) Turns the Synchronisation bit on
(R) Turns the Ring modulation bit on

For more details on these, see the sections entitled Advanced Effects and The Mixer. Suffice to say that a (G) must be visible to turn the sound on and actually hear it, and (S) and (R) only become effective when using more than one voice.

The next two options below are Gate and DE (u/d). Gate holds exactly the same value as Waveform, except for the gate bit which can be turned on and off. DE is short for delay and holds a value from zero to 255, this is decremented while the FX is playing, until it reaches zero.

Basically, GATE and DE operate together, because when DE reaches zero the current waveform is changed to the value in Gate. So if Gate is set to ON and the sustain is higher than zero then the effect can be made to continuously repeat, see the section Advanced Effects for more about Gate.

Down the left side of the screen are the following options: P.Rate (u/d). This is the rate at which the pulse value will change, and can be in the range 0-255, of course you must also be using a pulse waveform to enable this option. It will also have no effect when set to zero.

R/F Hi (u/d) is a rise or fall value from 0-255 which will be added or subtracted from the frequency high byte (the two left most sliders under frequency) depending on the values in the options: DE, SPEC.A, SPEC.B. This basically means that you can create a sound that rises in pitch, then suddenly falls or vice versa depending upon the settings.

R/F Lo (u/d) works in the same way as R/F Hi except it effects the frequency low byte (the two right most sliders under frequency), and makes the frequency rise or fall at a slow rate.

SPEC.A (u/d) is one of the main options during editing and is used as a flag to make the frequency rise or fall by adding or subtracting R/F Hi and R/F Lo, it holds a value from 0-6 which do the following:

0 = No effect
1 = Frequency rise
2 = Frequency fall
3 = Frequency rise if DE is not zero
4 = Frequency fall if DE is not zero
5 = Frequency fall if DE is zero/or rise if not
6 = Frequency rise if DE is zero/or fall if not

Values 0-4 should be self explanatory, lets say you chose 5 or 6 then you could create a sound that rises in pitch and then fades away, or vice versa.

SPEC.B (u/d) also operates on the Frequency and also uses R/F Hi and R/F Lo, it can dramatically change a sound depending on its value from 0-4 which do:-

0 = No effect
1 = Low/high frequency values are exchanged
2 = Frequency high fall, then result inverted
3 = Frequency high fall, then result part inverted
4 = Frequency high added to random number (0-15)

You don't really need to understand how SPEC.A or SPEC.B work, but listen and try to remember the changes in sound that they can produce.

Table 1 – the SID chip registers

	DECIMAL ADDRESS	HEX ADDRESS	FUNCTION
VOICE 1.....	54272	$D400	Frequency (low byte)
	54273	$D401	Frequency (high byte)
	54274	$D402	Pulse width (low)
	54275	$D403	Pulse width (high)
	54276	$D404	Waveform
	54277	$D405	Attack/Decay
	54278	$D406	Sustain/Release
VOICE 2.....	Same as voice 1, except the address's used are 54279 ($D407) to 54285 ($D40D).		
VOICE 3.....	Same as voice 1, except that the address's used are 54286 ($D40E) to 54292 ($D414).		

FX No (u/d) holds the current sound effect number, and can range from 1-32, this number is also used to playback the effect when you save out an FX player, or can be used in the Mixer when you create effects using more than one voice.

If Random is selected it will change the current effect to a set of random values, in other words it provides a quick and easy way to make a sound, for those times when you feel a bit lazy. Having done so, you can fine-tune (sorry) it by changing one or two options to create the exact effect you want. Note, this should be used with caution as it can wipe out the current effect.

Each of the editors 32 effects can be given a unique Name, this is displayed at the bottom of the screen. If you think of suitable names it can help you keep track of each type of effect, for example, if you are making an arcade game, suitable names could be Alien Explosion, Player 1 Laser, or something similar. To enter a name, type it in and then press RETURN or to abort and keep the previous name, press RUN/STOP.

If M.MENU is selected, it will take you back to the main menu (surprise, surprise).

The Sound FX Library

If you select the Library option from the Edit/Play section then you will enter the Sound FX Library. Here you can store up to 100 effects which you have created in Edit/Play. The library can be saved or a new one reloaded (from main menu), so you can make libraries of effect types. For example, you could have one library that stores all your explosion effects so that, when you need an explosion, you simply load up the corresponding library and copy the effect into the Edit/Play section.

There are a number of options in the library's sub menu. LIB.NO (u/d) holds the library number and can range from 1 to 100. To the right of the display is its name and below are the names of the next seven effects in the library. All of these names are taken from the Edit/Play section and are the only reference you have to find each effect in the library, so it is a good idea to use names you can relate to later.

COPY FX OUT will copy the current library effects into the current Edit/Play. Make sure that you save any effects that are already in memory or you may destroy an effect that you need. Alternatively, use the Exchange facility.

COPY FX IN will copy the current Edit/Play effects into the current library contents. The name of the Edit/Play effects is in the box at the bottom of the display. Again, use this with caution.

EXCHANGE FX will exchange both the library and Edit/Play effects, and can be very useful. For example, to hear the effects in the library without destroying the effects in the editor, simply exchange once and go back to the editor, play the library effects, re-enter the library, and exchange again to restore to normal.

EXIT MENU returns control to the Edit/Play section.

The Mixer

Selecting Mixer takes you to the Sound FX Mixer, where you can set up and play advanced effects using any combination of one, two or three voices. Each voice can hold an effect from the editor, which is assigned by locating the cursor to one of the three voices (at the top right of the display) and pressing fire with joystick up or down.

There are three options within the mixer. MIX NO (u/d) holds the current mix number, and ranges from 1 to 50, this means you can have a maximum of 50 mixes stored at any one time. This should be adequate for most of your projects and to hear the mix simply press the spacebar.

COPY PREVIOUS copies all the voices from the previous mix into the current one. This saves having to set up each voice from zero. Use with caution, as you might erase a mix by mistake.

EXIT MENU returns control to the Edit/Play section.

Save FX Player

This is the main part of the sound kit, as it allows you to save out a machine code player which can be used to play back your sound effects. The player runs via the IRQ routine (vectored via $0314) so it will run as a background task and can be called from both Basic and machine code programs. You will first have to enter a start address for your player, which can be given in decimal or hexadecimal (preceded with $). The address must be in the memory range from 1024 ($0400) to 63999 ($F9FF), if it is not then an error message will be displayed. Note that machine code users can freely choose any address within the range, including those under the ROMs, while Basic users are advised to enter an address in the range 49152 ($C000) to 52215 ($CBF7) so that the player will not occupy any memory used by Basic.

Next enter a filename and press RETURN. A screen will then be displayed containing all the main subroutines to call. It is most important that you jot these addresses down on a piece of paper, as they will be needed to hear your effects. Each subroutine is given as a SYS address for Basic users and a JSR (in hex.) for machine coders.

FX PLAYER ON turns on the player, clears all the registers in the sound chip and sets the volume ($D418) to 15.

FX PLAYER OFF turns the player off and sets the volume ($D418) to 0.

CLR REGISTERS stops any effect from playing and clears all the sound registers. It should be called before you play an effect so that it will not be affected by any voices it doesn't use, or to stop a continuous effect.

IRQ CONTROL can only be called by machine code users who wish to call the player from their own interrupt routine. If you do this, then you will also have to construct a suitable timing loop so the effects will be played correctly.

Also given are the beginning (BEG) and end (END) addresses of the player. Last, but not least, are the locations you will need to poke the FX number to, to tell the player which effect you want to play. These have been set to an area of free RAM and are as follows:
POKE 679 ($02A7)....VOICE 1
POKE 680 ($02A8)....VOICE 2
POKE 681 ($02A9)....VOICE 3
These addresses will remain the same no matter where you start the player.

For example, if you wanted to hear effect number 20 in voice 1 from Basic, then you would simply enter:
POKE 679,20

To reload a saved player from outside the Kit, a forced load must be used. For disk: LOAD "FILENAME",8,1 and for tape: LOAD "FILENAME",1,1.

SAVE FX DATA gives you a choice of saving either the 32 effects in the Edit/Play section (which includes the Mixer) or all the effects in the library.

LOAD FX DATA lets you reload a previously saved file of either Edit/Play data or Library data. The files will overwrite anything already in memory so make sure you save anything that may be needed first. After a file is loaded, it is checked and, if it is not the correct type, an error message will be displayed. To abort when loading, press the RUN/STOP key.

DISK DIRECTORY displays the directory of the disk in drive 0 (that is, any Commodore single drive).

DOS COMMANDS will send a disk command or read the error channel. This simplifies sending commands by reducing the syntax to its minimum. For example, SO: TEST would scratch the file called 'TEST', consult your disk drive manual for other commands.

DEVICE will toggle the device number between disk (device 8) or tape. Even though the FX kit was primarily designed for disk use, it can successfully be used with tape. Note, if you do select tape then the Disk Directory and Dos Command options will cease to function, this is simply a safeguard so that the disk error channel cannot be read accidently.

PRINT OPTIONS brings up another menu for use with a Commodore printer (device 4). MIXER VOICES will print out the whole of the Sound FX Mixer which includes the effect numbers stored in each voice. LIBRARY NAMES gives a printout of all the current Sound FX Library which includes the library number with its corresponding name.

In both cases, follow the on-screen instructions. If, for any reason, the printer light flashes then you should switch the printer off and try the option again.

Extra Keyboard Functions

The FX Kit also contains certain functions which are only accessed via the keyboard and operate as follows. When in the Edit/Play Section you can use:

(F5) ... Stops an effect by clearing the sound registers.
(F7) ... Plays the mix currently in the Mixer.
(Space) ... Plays the current effect being edited.

It is important to clear the registers by pressing F5 after F7 so that any sounds in voices 2 or 3 will not affect the current effect when you play it.

There is only one major keypress when in the Sound FX Mixer and that is the 'spacebar' which plays the current mix. You can also pause the FX Kit by pressing 'P' - to unpause, press 'P' again. Pause will only work when on the main menu, the Edit/Play section, the FX Library of the Mixer.

The RUN/STOP key is used in a variety of different ways. It can be pressed when you wish to abort any input, such as when entering a filename, to abort any loading or printing, and to exit from a menu.

Advanced Effects

If you require a more interesting sound than that produced by one voice, then two techniques exist in the SID chip which allow the various voices to be combined with each other in a number of different ways. They are called synchronization and ring modulation and can create a sound which, though a mixture of two tones, might produce additional tones depending on the frequency. You can only synchronize or modulate one voice against one other, but some great effects can be created using these features. They make it every easy to synthesise weird or metallic noises, or even emulate instruments like chimes and gongs.

Synchronization and ring modulation are two separate bits which exist in the waveform of each voice. They are shown as (S) and (R) in the Waveform option of the Kit. Each can be turned on or off but ring modulation will only operate with a triangle waveform, though synchronization can be freely used with any of the waveforms. Care must be taken if you want to combine both effects.

To set up either effect you will need two effects, each of which must be played through the correct voice. You can do this by using the Mixer options

in Edit/Play. Only certain configurations of the two voices must be used:
Voice 1 with Voice 3
Voice 2 with Voice 1
Voice 3 with Voice 2
So, to use ring modulation with voice 1, you need to set the waveform to triangle and enable the (R) and (G) of the effect in voice 1 and then create an effect in voice 3 with any frequency. The Gate option is switched to OFF and the (G) in its waveform is disabled. Although this appears to turn voice 3 off, ring modulation is still active.

All of that may seem rather complicated but the best way to tackle these features is by continually playing around with each option until you get the desired effect. You may also find it useful to examine the demonstration effects supplied with the Kit.

The Chip Registers

When you play an effect in the Edit/Play section you will be using the voice 1 registers only. Table 1 lists all of the registers used and their addresses in the 6581 SID chip. The volume is set to its maximum of 15 in register 54296 ($D418) and none of the filters are actually used.

Loading The Kit

To load the Kit type LOAD"THE SOUND FX KIT",8,1 and it will automatically RUN.

On The Disk

There are a few files that come with the Kit, which form a demonstration showing how to call the sound effects from Basic. This can be loaded with LOAD "SOUND FX DEMO",8 and then RUN.

The effects in this demo are on another file and can be loaded into the Kit so that you can see and learn how they were done. To do this, load the file 'DEMO EDIT DATA' into the Edit/Play section using the option 'Load Data File' on the main menu, then go straight to the Mixer.

To help you get used to using the FX Library, I have created a library containing 25 different effects. Each of these must be copied into the editor before you can hear them. First of all load the file 'FX LIBRARY' using the 'Load Data File' option.

Introducing SID

Creating sounds in programs may seem a daunting prospect, but it's not as difficult as you might think

By Paul Eves

To most 64 and C128 users, the very idea of trying to create sound within programs is a daunting thought. However, with a little knowledge and understanding of the SID chip, it's surprising how easy it can be. Hopefully, by the time you've finished this article you will have gained a little more confidence with sounds. You probably won't become a budding 'Rob Hubbard', but you should gain a little more insight into SID itself, and what makes it tick. Let's start with a few basics.

Sound Interface Device

The chip that produces sound is the Sound Interface Device, SID for short, and it lies at memory locations 54272-55295 ($D400-$D7FF). Actually, the chip has three separate sound synthesizers, known to us as voices. You can control them all individually, or mix them as you wish. By clever use of these voices, we can produce our Orchestral Masterpieces... (in my case, our simple key-beeps).

The area that most concerns us lies between 54272 and 54300 ($D400-$D41C). Altogether, this gives us 29 registers in which to control the sounds we wish to produce. The remainder of the memory map is used for the SID images, which don't concern us at this point.

For simplicity's sake, I won't go into great technical detail on the make-up of SID. For example, words like Amplitude Modulator, Tone Oscillator and Dynamic tone colors are a little foreboding. On the other hand, Waveforms, Envelopes and Volume are a little easier to grasp. In order to produce our masterpieces, we need to know something of what goes into making a single note.

First of all, you need a frequency. The frequency is the rate at which the 'Sound Waves' move per second. This movement is known as Cycles per second, or Hertz. The 64 can produce sounds of 0.6 Hertz to 3995 Hertz, and these waves all have specific shapes or forms. These waveforms, as they are known, are what give us the different sounds. For example, someone blowing a trumpet in the key of F sounds very different to someone plucking a guitar string in the same key.

Finally, we need some volume. This last item is better known as the ADSR setting. This stands for Attack, Decay, Sustain and Release. As you know, if you pluck a violin string, the sound gradually rises and then subsides, and this rising and falling of the note's volume is the envelope. These then are the basic components that make up a note. Before we start to produce them though, we need to know just where to look in memory.

As mentioned earlier, in SID there are 29 registers. Each of the three voices use seven registers. Of the remaining eight, four concern the filtering and overall volume, and the other four control the game paddles and Voice 3 output. Figure 1 gives us the breakdown of the SID chip registers. As you can see, the functions are almost identical for each voice, and this makes programming a little easier. Like everything else on the Commodore Machines, we have the usual Low Byte/High Byte format for splitting the values we wish to Poke into the registers.

So how do we work out what values we need for any given frequency? There are two methods available to us – you can go the long way round and do some calculations, or you can take the short cut and refer

Figure 1

SID starting address is 54272 ($D400)

Register number Decimal	Hex	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	This register controls	
0	$00	FR7	FR6	FR5	FR4	FR3	FR2	FR1	FR0	Low byte of frequency	Voice 1
1	$01	FR15	FR14	FR13	FR12	FR11	FR10	FR9	FR8	High byte of frequency	
2	$02	PW7	PW6	PW5	PW4	PW3	PW2	PW1	PW0	Low byte of pulse width	
3	$03	–	–	–	–	PW11	PW10	PW9	PW8	High nibble of pulse width	
4	$04	Noise	Pulse	Saw-tooth	Trian-gular	Test	Ring mod	Sync	Gate	Gate and wave form control	
5	$05	ATK3	ATK2	ATK1	ATK0	DCY3	DCY2	DCY1	DCY0	Attack/decay	
6	$06	SST3	SST2	SST1	SST0	RLS3	RLS2	RLS1	RLS0	Sustain/ release	
7	$07	FR7	FR6	FR5	FR4	FR3	FR2	FR1	FR0	Low byte of frequency	Voice 2
8	$08	FR15	FR14	FR13	FR12	FR11	FR10	FR9	FR8	High byte of frequency	
9	$09	PW7	PW6	PW5	PW4	PW3	PW2	PW1	PW0	Low byte of pulse width	
10	$0A	–	–	–	–	PW11	PW10	PW9	PW8	High nibble of pulse width	
11	$0B	Noise	Pulse	Saw-tooth	Trian-gular	Test	Ring mod	Sync	Gate	Gate and wave-form control	
12	$0C	ATK3	ATK2	ATK1	ATK0	DCY3	DCY2	DCY1	DCY0	Attack/decay	
13	$0D	SST3	SST2	SST1	SST0	RLS3	RLS2	RLS1	RLS0	Sustain/ release	
14	$0E	FR7	FR6	FR5	FR4	FR3	FR2	FR1	FR0	Low byte of frequency	Voice 3
15	$0F	FR15	FR14	FR13	FR12	FR11	FR10	FR9	FR8	High byte of frequency	
16	$10	PW7	PW6	PW5	PW4	PW3	PW2	PW1	PW0	Low byte of pulse width	
17	$11	–	–	–	–	PW11	PW10	PW9	PW8	High nibble of pulse width	
18	$12	Noise	Pulse	Saw-tooth	Trian-gular	Test	Ring mod	Sync	Gate	Gate and waveform control	
19	$13	ATK3	ATK2	ATK1	ATK0	DCY3	DCY2	DCY1	DCY0	Attack/decay	
20	$14	SST3	SST2	SST1	SST0	RLS3	RLS2	RSL1	RLS0	Sustain/release	
21	$15	–	–	–	–	–	CFR2	CFR1	CFR0	Low 3 bits of cutoff/ center frequency	Filter/volume
22	$16	CFR10	CFR9	CFR8	CFR7	CFR6	CFR5	CFR4	CFR3	High 8 bits of cutoff/ center frequency	
23	$17	RES3	RES2	RES1	RES0	Filter external	Filter V3	Filter V2	Filter V1	Resonance/ filter	
24	$18	V3 silent	High pass	Band pass	Low pass	Volume 3	Volume 2	Volume 1	Volume 0	Filter mode/ volume	
25	$19	GPX 7	GPX 6	GPX 5	GPX 4	GPX 3	GPX 2	GPX 1	GPX 0	Game paddle X	Other
26	$20	GPY 7	GPY 6	GPY 5	GPY 4	GPY 3	GPY 2	GPY 1	GPY 0	Game paddle Y	
27	$21	V30 7	V30 6	V30 5	V30 4	V30 3	V30 2	V30 1	V30 0	Voice 3 oscillator	
28	$22	V3E 7	V3E 6	V3E 5	V3E 4	V3E 3	V3E 2	V3E 1	V3E 0	Voice 3 envelope	

to Figure 2. This gives us the necessary values to poke for each of the eight octaves for any given note.

Going back to the long way, in order to poke the 16 bit value into memory we do a little calculation. We take the Hertz value of the note and divide this by .0609592, the computer's clock speed. This gives us the Frequency value for SID. Next, we divide this frequency by 256, and this gives us the high byte of the setting. The remainder gives us the low byte. These two values are what we poke into the required memory locations.

For example, if you wanted to set Voice 2 to produce a sound of 185 hertz you first divide 185 by .0609592. This gives you 3035. Next divide 3036 by 256, which gives 11 remainder 219. Therefore, we would Poke 219 into memory location 54272+7 and Poke 11 into 54272+8. This then is the principal for setting the frequency.

Waveforms/ADSR

To set a waveform is much simpler. The fifth register in each voice section is used for this. Note that only the upper nibble is used for this purpose. The sixth and seventh registers of each voice are set aside for the ADSR settings. So that you fully understand what this means, refer to Figure 3 as you read the next paragraph.

The cycle or life of a sound is split into four stages. Stage one gives us the initial zero volume up to it's maximum – the attack. Stage two sees the maximum volume dropping off – the rate at which this drops is the decay. Stage three is the period at which the note stays at this lower volume, the sustain., Finally, the last stage is the falling back to a zero volume – this is the release rate. Because the values of these settings range from zero to 15, we can store the value in four bits. Hence the reason for only using two registers of each voice for four functions.

Refering back to Figure 1, bit zero of register five for each voice shows this as the 'Gate'. In order to actually hear the sound we program, this gate must be triggered. To do this we poke a value of 1. A value of 0 will turn it off.

More intricate Techniques

Although it's beyond the scope of this article, I would like to briefly mention some of the techniques for producing better quality sound.

The harmony part of any waveform may be altered by employing a filter. Like everything else, the filters can be used on a single voice, or on a combination. The usage of filtering produces a clearer tone to your sounds.

Synchronization of two voices is another way of producing a more complex sound. The best known example of this is the Mosquito imitation.

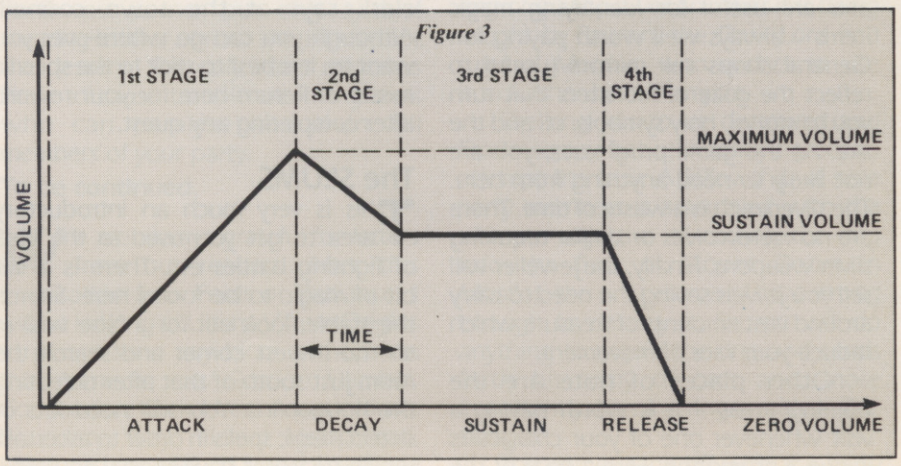
Octave	Note name	Frequency in hertz	SID freq. setting	High byte of SID freq. set.	Low byte of SID freq. set
0	C	16.4	269	1	13
0	C#	17.3	284	1	28
0	D	18.4	302	1	46
0	D#	19.4	318	1	62
0	E	20.6	338	1	82
0	F	21.8	358	1	102
0	F#	23.1	379	1	123
0	G	24.5	402	1	146
0	G#	26.0	427	1	171
0	A	27.5	451	1	195
0	A#	29.1	477	1	221
0	B	30.9	507	1	251
1	C	32.7	536	2	24
1	C#	34.6	568	2	56
1	D	36.7	602	2	90
1	D#	38.9	638	2	126
1	E	41.2	676	2	164
1	F	43.7	717	2	205
1	F#	46.2	758	2	246
1	G	49.0	804	3	36
1	G#	51.9	851	3	83
1	A	55.0	902	3	134
1	A#	58.3	956	3	188
1	B	61.7	1012	3	244
2	C	65.4	1073	4	49
2	C#	69.3	1137	4	113
2	D	73.4	1204	4	180
2	D#	77.8	1276	4	252
2	E	82.4	1352	5	72
2	F	87.3	1432	5	152
2	F#	92.5	1517	5	237
2	G	98.0	1608	6	72
2	G#	103.8	1703	6	167
2	A	110.0	1804	7	12
2	A#	116.5	1911	7	119
2	B	123.5	2026	7	234
3	C	130.8	2146	8	98
3	C#	138.6	2274	8	226
3	D	146.8	2408	9	104
3	D#	155.6	2553	9	249
3	E	164.8	2703	10	143
3	F	174.6	2864	11	48
3	F#	185.0	3035	11	219
3	G	196.0	3215	12	143
3	G#	207.7	3407	13	79
3	A	220.0	3609	14	25
3	A#	233.1	3824	14	240
3	B	246.9	4050	15	210
4	C	261.6	4291	16	195
4	C#	277.2	4547	17	195
4	D	293.7	4818	18	210
4	D#	311.1	5103	19	239
4	E	329.6	5407	21	31
4	F	349.2	5728	22	96
4	F#	370.0	6070	23	182
4	G	392.0	6431	25	31
4	G#	415.3	6813	26	157
4	A	440.0	7218	28	50
4	A#	466.2	7648	29	224
4	B	493.9	8102	31	166
5	C	523.3	8584	33	136
5	C#	554.4	9095	35	135
5	D	587.3	9634	37	162
5	D#	622.3	10208	39	224
5	E	659.3	10815	42	63
5	F	698.5	11458	44	194
5	F#	740.0	12139	47	107
5	G	784.0	12861	50	61
5	G#	830.6	13625	53	57
5	A	880.0	14436	56	100
5	A#	932.3	15294	59	190
5	B	987.8	16204	63	76
6	C	1046.5	17167	67	15
6	C#	1108.7	18188	71	12
6	D	1174.7	19270	75	70
6	D#	1244.5	20415	79	191
6	E	1318.5	21629	84	125
6	F	1396.9	22915	89	131
6	F#	1480.0	24278	94	214
6	G	1568.0	25722	100	122
6	G#	1661.2	27251	106	115
6	A	1760.0	28872	112	200
6	A#	1864.7	30589	119	125
6	B	1975.5	32407	126	151
7	C	2093.0	34334	134	30
7	C#	2217.5	36377	142	25
7	D	2349.3	38539	150	139
7	D#	2489.0	40831	159	127
7	E	2637.0	43258	168	250
7	F	2793.8	45831	179	7
7	F#	2960.0	48557	189	173
7	G	3136.0	51444	200	244
7	G#	3322.4	54502	212	230
7	A	3520.0	57743	225	143
7	A#	3729.3	61177	238	249
7	B	3951.1	64815	253	47

Figure 2

Final Notes

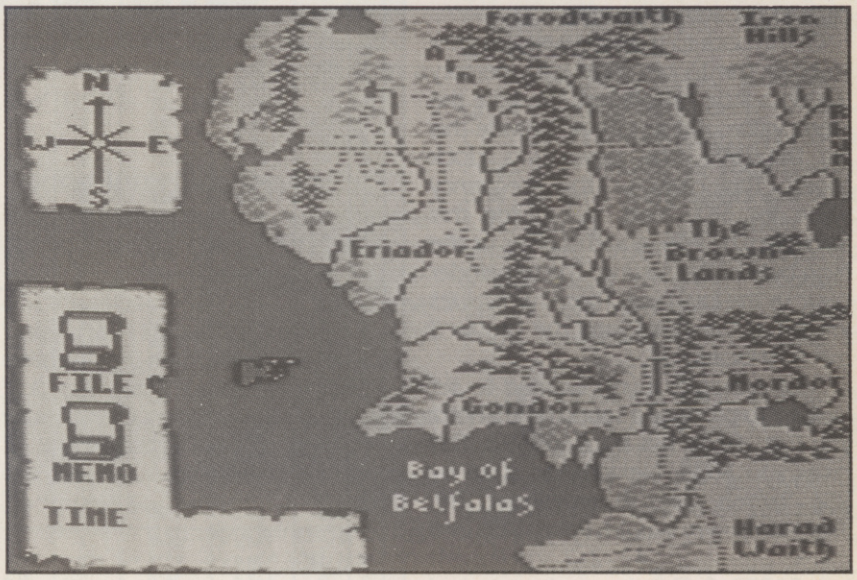
One point to remember when poking to SID's registers is that, like the sprite registers, you can add up values and combine them into one poke for any given register.

Figure 3



Disk Dungeons

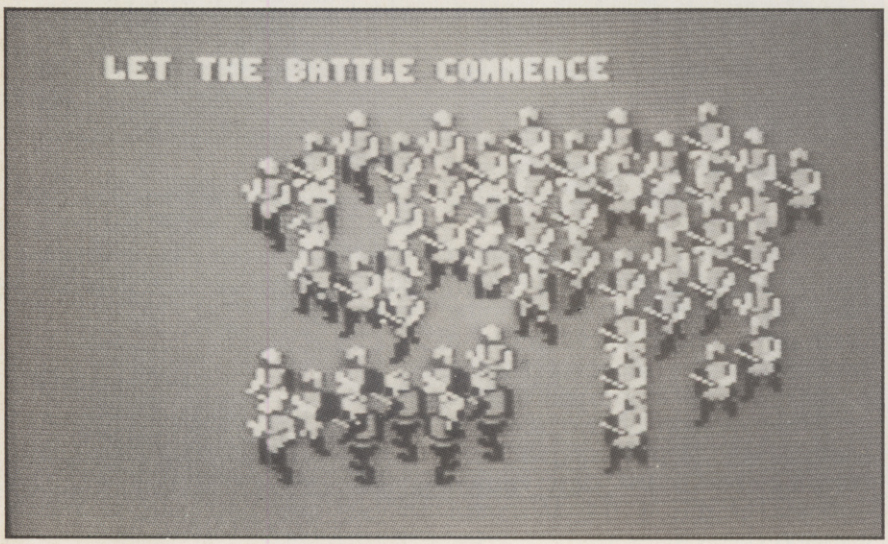
In the last issue, I gave some general tips to help you with Pools of Radiance, the first Dungeons and Dragons game from SSI. Now, here is a more detailed solution.



PHLAN

This is the one area of the game where you are permanently safe unless you decide to do something stupid such as attack the City Guard. You will not be allowed to sleep on the streets though – use one of the inns instead to learn your spells. There are three temples offering a variety of healing services from curing light wounds to raising the dead but they are fairly expensive. There is no difference between the temples. Taverns can be used for gambling, brawling and listening to gossip.

There are four types of shop. Armour shops sell a variety of weapons and are useful for identifying magic items – always well worth paying for. General shops sell mirrors (useful to reflect the gaze of monsters that turn you to stone), holy symbols, oil and the like. As the game progresses, you are not likely to need anything from here. The silversmith is a waste of time. There are no werewolves or similar requiring silver weapons. Finally, the jeweller will sell you jewels saving the need to carry around vast amounts of treasure which reduce your rate of movement.



Other places of note are the training areas – it is worth paying a visit whenever one of your characters is due a promotion. Hire a boat at the dock to take you to Sokal Keep and, once you have cleared that area, the wilderness. Finally, listen to what the clerk says at the town council. Although you can go where-ever you want to, it is best to stick to the specific missions. Return here for your reward after completing any quest.

The SLUMS

This is very much an introductory area to get you used to the idea of fighting battles etc. There is a fair bit of magic to be found here. Search the stable, look out for a false wall in the northwest corner and search the room just south of that after defeating the hobgoblins. You will need lots of detect magic spells in order to ascertain which treasures have special powers.

Do not attack the gypsy or the random encounters with monsters will become harder. Accept Ohlo's quest and search for the potion in the Rope Guild and return it to him for a reward. Following the left hand wall in the Guild ensures that you find all the vital rooms. The one dangerous encounter is with the trolls and ogres. If you do not have a fireball spell on a scroll, make sure that you attack the trolls first using missile weapons – the ogres prevent the trolls from reaching your characters. Watch out for the trolls regenerating though.

KUTO'S WELL

Lots of Kobolds and Lizardmen to fight here. On the upper level, the only real treasure is guarded by the hag in the middle of the south wall. If you venture down the well, you will discover the secret lair of Norris the Grey. You will be ambushed and your party will take a fair old battering so don't go down until your party is at full strength. Norris has a fair horde of treasure hidden so search carefully. Once you have cleared this area, the well makes an excellent base for resting.

SOKAL KEEP

This castle is reached via the docks in Phlan. Search the elf skeleton outside the gates before entering to get the three passwords. The keep is patrolled by zombies and skeletons. One of the passwords will keep them

at bay though, if you don't fancy a battle. The other creatures include poisonous frogs and scorpions. It is worth while having one of your clerics prepare a slow poison spell just in case the worst happens. The frogs are guarding hidden treasure.

As you enter the main area of the keep, you will be attacked by a large force of some fifty odd orcs and goblins. Don't panic! Make good use of your sleep spells by aiming for the monsters in the front rank but be careful not to put anyone in your own party to sleep. Then you can use missiles to take out the enemy archers. You will not have to fight all the monsters as they will turn and run if they think that you are doing too well.

West of the orcs are the wailing spirits. Say "lux" and they will quieten down and show you their treasure. To the south of the orcs lies the altar where you encounter the ghost of Ferran Martinez. Do not attack him! Instead, parlay and say "lux" again. He will give you information as to the location of the secret armoury in the north east corner of the keep. Answer him truthfully and his soul will then be able to rest in peace. Once the keep has been cleared, you will be able to catch boats from the docks in Phlan to the wilderness beyond Sokal.

MANTOR'S LIBRARY

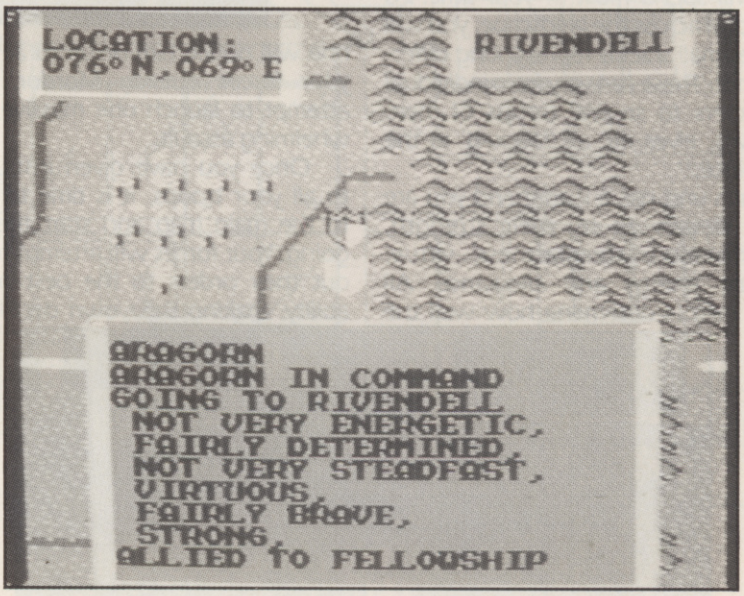
Wander round here with search mode permanently switched on. There are five special books to be found, three in the history section and two in the philosophy plus assorted other treasure. You will have to battle off a basilisk so use mirrors and spells that improve your armour class. Talk to the kobolds to get a map and listen to the madman but don't let him join your party. As you leave the library, you will be attacked by a spectre. Try not to let him hit you as you will automatically lose two experience levels. If this does happen, use the seventh level restore spells that you should have acquired on scrolls.

PODOL PLAZA

When you first enter the plaza, the chances are that you will be on the secret mission from the council. If so, disguise yourself as monsters and infiltrate the crowd at the auction in the centre of the square. If you are not on the secret mission, then there is little in the square to interest you. You can desecrate the temple of Bane to the east or brawl with the buccaneer in the pit to the west. He is carrying magic items. If you suffer too much damage in the random encounters, there is a secret temple in the southwest corner where you can rest and be healed. The doors however are wizard locked and you will need two knock spells to get past them.

CADORNA TEXTILE HOUSE

You are searching for the Cadorna family treasure here and also looking for Skullcrusher. The High Priestess Grishnak (towards the southwest corner) owns the brass key which unlocks Skullcrusher's chains (he is further south). In the southeast corner, ogres guard the treasure box.



You can either return it intact to Cadorna for a reward or take it to the Thieves who will open the box for a share of the loot and then reseal it so that Cadorna does not know it has been tampered with. The entrance to the thieves' guild is towards the northwest corner but only a thief wearing leather armour should attempt the descent. The only other creatures likely to cause trouble are the ghouls who can paralyse and then kill members of your party.

To be continued.

We are always grateful for letters from our readers. After this serialisation from Pools or Radiance, I will be looking at Ultima V from Origins so please send any hints and tips on that game to me, Gordon Hamlett, Commodore Disk User, Argus House, Boundary Way, Hemel Hempstead, Hertfordshire HP2 7ST and I will see if I can organise a prize for the best letter.

War in Middle Earth

In the beginning, there was the *Hobbit*, bought by thousands of adventurers and solved by few. Many readers of this column will have memories, fond or otherwise of Thorin, singing about gold or trying to escape from the goblins' dungeon. Then there was *Lord of the Rings*, flawed and unbelievably slow and not really a suitable story for making into an adventure.

Now from Melbourne House comes *War in Middle Earth* which is a strategy game based on more or less the whole of Tolkien's epic. No half measures here!

For anyone unfamiliar with the story of Lord of the Rings, here is a very brief precis. Frodo is a hobbit and has been given a Ring by his Uncle Bilbo Baggins who acquired it from a creature called Gollum, as detailed in the book The Hobbit. Gandalf the Wizard informs Frodo that this ring is a magic ring of great power and that it is being sought by Sauron, the Dark Lord and ruler of Mordor, who wishes to use it to further his evil empire.

The ring has to be destroyed and Frodo somewhat reluctantly agrees to attempt the task. A fellowship of nine party members is assembled with the ultimate objective of casting the ring into the fires of Mount Doom in Mordor, the only source of heat strong enough to destroy it. Sauron will do anything to regain the ring and sends forth his army of orcs and, more importantly, his nine ring wraiths – The Nazgul.

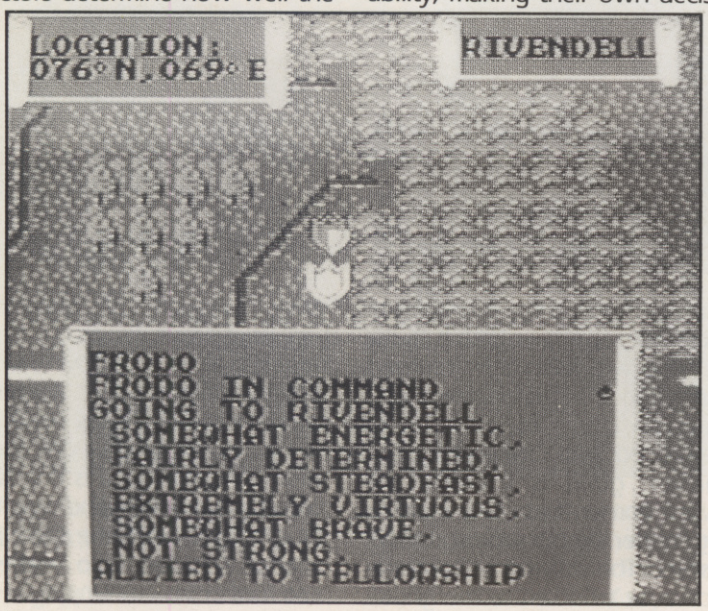
The game starts off with the party

at Rivendell, home of Elrond. You win if you manage to destroy the ring. The Dark Forces win if they recapture the ring and return it to Sauron. You do not have to follow the plot of the book exactly but can use any strategy you think might be successful.

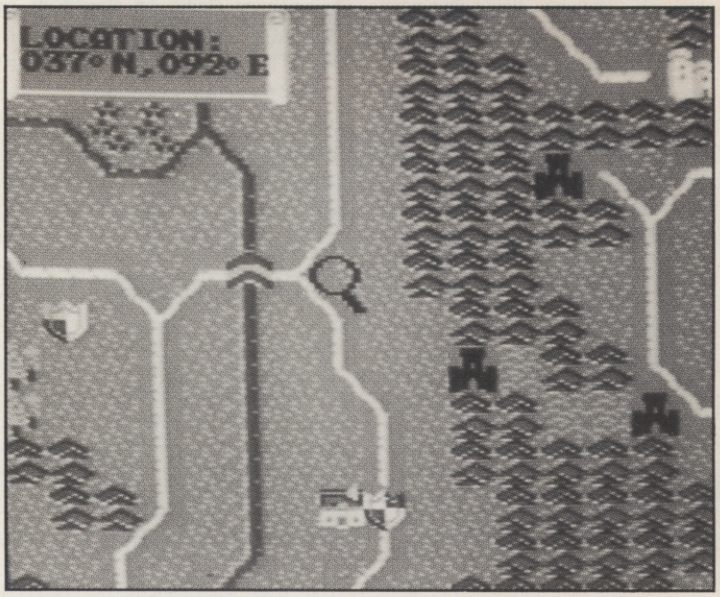
The gameplay is on three different levels. The Middle Earth map shows the whole of the region and it is from here that you can access icons allowing you to save and load files, read any messages and actually get the game in motion by starting the passage of time.

By clicking onto the map of the Middle Earth, you bring up the campaign map. This is a much expanded version of the first map and is where you will spend most of your time. As you scroll across the landscape, you will notice small shields representing different units. These can vary from individual characters to several troops of men, dwarves, elves etc all 'stacked' in the one place.

Each unit has a leader and you are given details as to their strength, determination, steadfastness, virtue, bravery, energy and allegiance. All these factors determine how well the unit performs in battle as, to some extent, does the terrain they are attacking or defending – it is easier to defend a keep than open ground.



You command all the units of the Free Folk and can move them about as you see fit by selecting a destination for them to move to. You can also merge units and request that they follow a given party. The possibilities for different tactics are endless. At either extreme, you can try and sneak Frodo off on his own, hoping that no-one will notice him or try to amass all your forces outside Mordor, in an attempt to launch one massive, overwhelming assault.



Once you have given instructions to all your troops, it is time to return to the main map and start the clock going. Your forces will attempt to carry out their orders to the best of their ability, making their own decisions as to which route to follow.

The clock stops when combat is about to ensue and it is here unfortunately that the game really falls down. There is no provision for you to issue instructions from within a battle. Instead, you are in charge of every soldier on an individual basis – the rest just stand around waiting for instructions rather than getting on with it.

The method of controlling the soldiers is also much too fiddly. You have to move a cursor over a soldier's feet the rest of his body is useless – and then assign him to a particular target. As all the enemy soldiers are moving round like something possessed, this can take some time before you actually make contact with the desired opponent.

The result of all this leads to some strange anomalies. I know wizards are strong but I am sure that Saruman could not cope with a concerted attack from seventy-one men. As it is he wandered round at will picking off individual targets simply because I was unable to get more than three or four men attacking at any given time.

There is no way that you opt out of battle or run away once it has started and this led to another problem. Even though you are moving stacks of units to the same place, they do not all move at the same speed and tend to split up thus leaving smaller groups to be picked off by roving bands of the enemy. I managed to lose several commanders simply because they had moved one square away from their troops and got set upon by thirty odd orcs.

War in Middle Earth has obviously been designed as a sixteen bit game and I must say, I would love to play it on the Amiga. As it stands on the C64, this is very much a cut down version with the result that it appears somewhat over ambitious. If the problems with the combat could be sorted out, this could have been a very good strategy/adventure game. As it stands, I suspect that all but the most devoted fan will find it frustrating. Tolkien is not necessarily hobbit forming.

take note of this!

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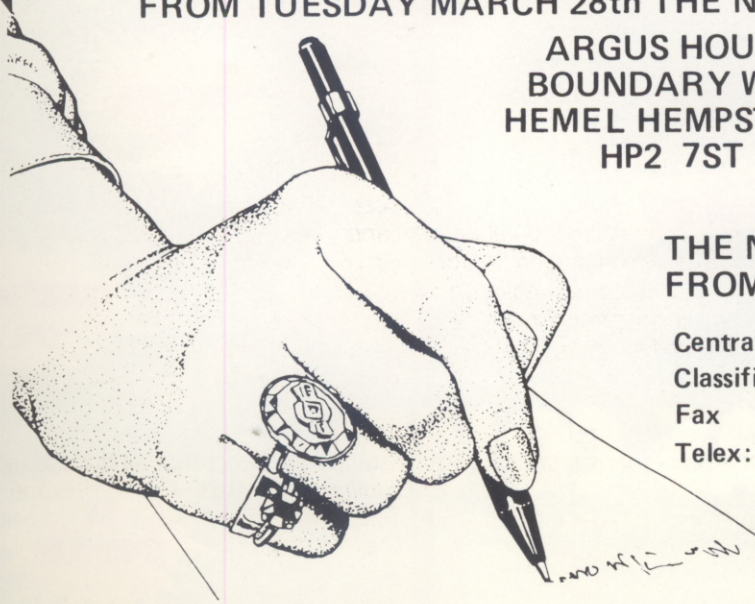

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